United Water Conservation District

2005

Urban Water Management Plan

For the Oxnard-Hueneme System

Adopted by the UWCD board of directors on February 9, 2005

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1.0 Introduction

United Water Conservation District, among its many activities, operates the Oxnard-Hueneme System (OH System), which supplies drinking water to cities and urban areas on the Oxnard Plain. The OH water supply is an important part of the infrastructure of those cities. A safe and reliable water supply is necessary to protect the health of residents and to maintain a healthy local economy. This Urban Water Management Plan provides planning information on the reliability and future availability of the OH water supply.

2.0 Background and History of United Water

United Water Conservation District manages groundwater and delivers water to cities and agriculture within a large part of Ventura County. Ventura County ranks around 13th among all counties in the U.S. in agricultural production, with over one billion dollars in annual revenues, largely due to reliable, low-cost water. Ventura County is first in the nation in strawberries, lemons and celery. Among United's urban water customers are the cities of Oxnard, Ventura, Port Hueneme, and two U.S. Naval bases. The District got its name in 1954 when farmers and cities "united" to develop local water supplies. United Water is a public agency with an elected board of directors.

The original founding organization for United Water was called the Santa Clara River Protective Association. It was formed in 1925 to protect the runoff of the Santa Clara River from being appropriated and exported outside the watershed. One reason local farmers formed the Association was to prevent the Los Angeles Department of Water and Power from exporting local water to Los Angeles. The Association was followed in 1927 by the Santa Clara Water Conservation District, which was formed to obtain water rights, recharge groundwater, and to serve river water to local farms. In those days, surface water from the Santa Clara River was diverted near Saticoy for use on farms in the valley and on the Oxnard Plain. The District began a systematic program of groundwater recharge in 1928, primarily by constructing spreading grounds along the Santa Clara River in Piru, Santa Paula, and Saticoy.

In the early 1900s, groundwater was so plentiful in the Oxnard Plain that water wells would run freely under artesian pressure. Seeping groundwater caused the ocean to be fresh near the coast, and ships refilled their water stores while anchored offshore. But by the early 1950s, over-pumping had caused seawater to intrude into about 20 square miles of the aquifer near the coast, causing some wells to become unusable. In 1954, cities and farmers "united" to solve these problems, and formed United Water Conservation District to recharge underground aquifers and to supply water to cities and farms. The former Santa Clara Water Conservation District, which was not allowed by statute to serve municipalities, was dissolved. Many water facilities were built in the 1950s, including the Santa Felicia Dam (Lake Piru), new spreading grounds at Saticoy and El Rio, the OH drinking water system, and the Pleasant Valley pipeline (to replace canals on the Oxnard Plain). Since then, other facilities have been built as needed to manage local water, including the Pumping Trough Pipeline (serving agriculture on the Oxnard Plain), the improved Freeman Diversion Dam on the Santa Clara River, and the OH system improvements in 1998. Since it was formed in 1954, United has equally served both cities and farms within its service area. In many ways, United is a microcosm of water management practices within the State of California.

3.0 United Water's Mission Statement

United's goals are best exemplified in its mission statement:

> *United Water Conservation District shall manage, protect, conserve, and enhance the water resources of the Santa Clara River, its tributaries and associated aquifers, in the most cost-effective and environmentally balanced manner.*

Associated with the District's mission statement are several guiding principles. The guiding principle most closely associated with its drinking water system is as follows:

> *Deliver safe and reliable drinking water that meets current and future health standards to cities and urban areas.*

4.0 Requirement to Prepare an UWMP

The Urban Water Management Planning Act (Water Code 10610 *et al*.) requires urban water suppliers to evaluate their current and projected water sources/supplies, water uses, supply reliability, comparison of supply and demand, water demand management (conservation) programs, wastewater recycling and drought contingency planning. United Water is required to prepare an UWMP because it supplies more than 3,000 acre-feet of water annually and treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

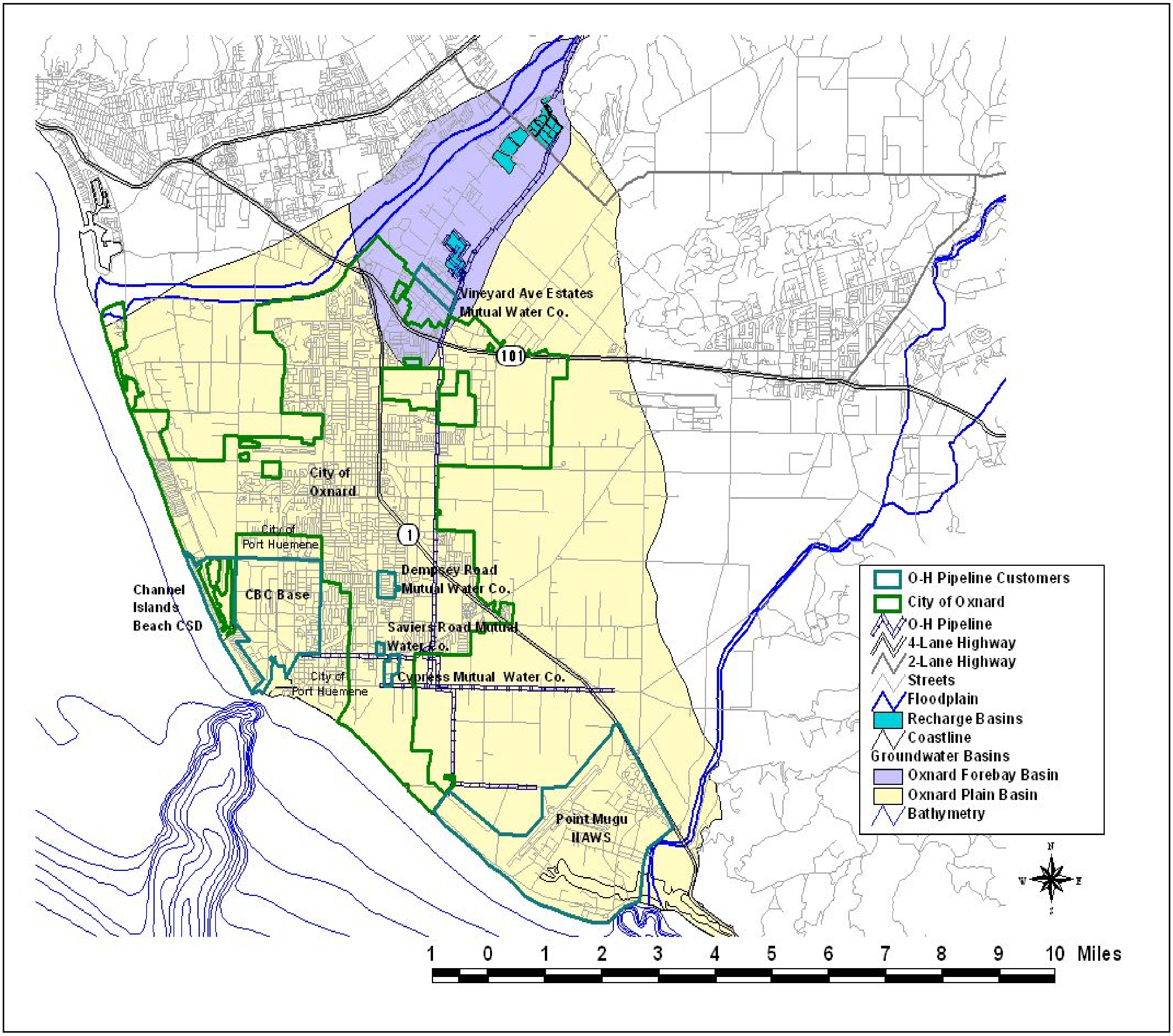
This Urban Water Management Plan is limited primarily to the Oxnard-Hueneme drinking water system. Other facilities are evaluated herein only to the extent that they may affect the OH water supply.

5.0 Service Area

The service area of the OH system is located on the Oxnard Plain, in the vicinity of Oxnard, as shown on Figure 5-1. The OH System supplies part of all of the drinking water supply for the wholesale customers listed below:

- The City of Oxnard (Oxnard)
- Port Hueneme Water Agency (PHWA) consisting of
  - The City of Port Hueneme
  - Two U.S. Naval bases, now jointly called Naval Base Ventura County
  - Channel Islands Community Services District (CIBCSD)
- Dempsey Road Mutual Water Company
- Cypress Mutual Water Company
- Saviers Road Mutual Water Company
- Vineyard Avenue Estates Mutual Water Company
- Ocean View Municipal Water District (OVMWD)
- Rio Del Valle and Rio Real Schools

Figure 5-1
OH System Service Area Map



In addition, there are a few small customers along the Mugu Lateral Pipeline, which was formerly part of the OH System. The Mugu Lateral has been leased by PHWA and those customers now receive water directly from PHWA.

The City of Oxnard has three sources of water: United Water's OH System, Calleguas MWD, and their own City wells. Water received from Calleguas MWD is imported from Northern California, and is of higher quality (lower total dissolved solids and minerals) than local water. Oxnard blends its Calleguas and local (United plus City wells) supplies at about a one-to-one ratio to deliver water of a reasonable quality and taste. In effect, the use of OH water reduces the use of water imported from the north.

Port Hueneme Water Agency receives United's OH water and treats it with RO, EDR, and/or ultrafiltration to remove the salts and improve its quality. PHWA also receives water directly from Calleguas MWD.

Ocean View MWD provides OH water primarily to agricultural customers. There are a few domestic services on the Ocean View pipeline, to farm houses and businesses. The Ocean View pipeline (a lateral to the OH pipeline) is owned by the City of Oxnard. United Water reads the Ocean View meters every month, collects payments from the Ocean View customers, and pays Ocean View MWD the amount received, less administrative costs. Maintenance on the Ocean View pipeline is performed by Oxnard under contract to Ocean View MWD. The number of Ocean View customers has been declining over time due to the high cost of the water, and the future of the Ocean View pipeline is the subject of ongoing concern.

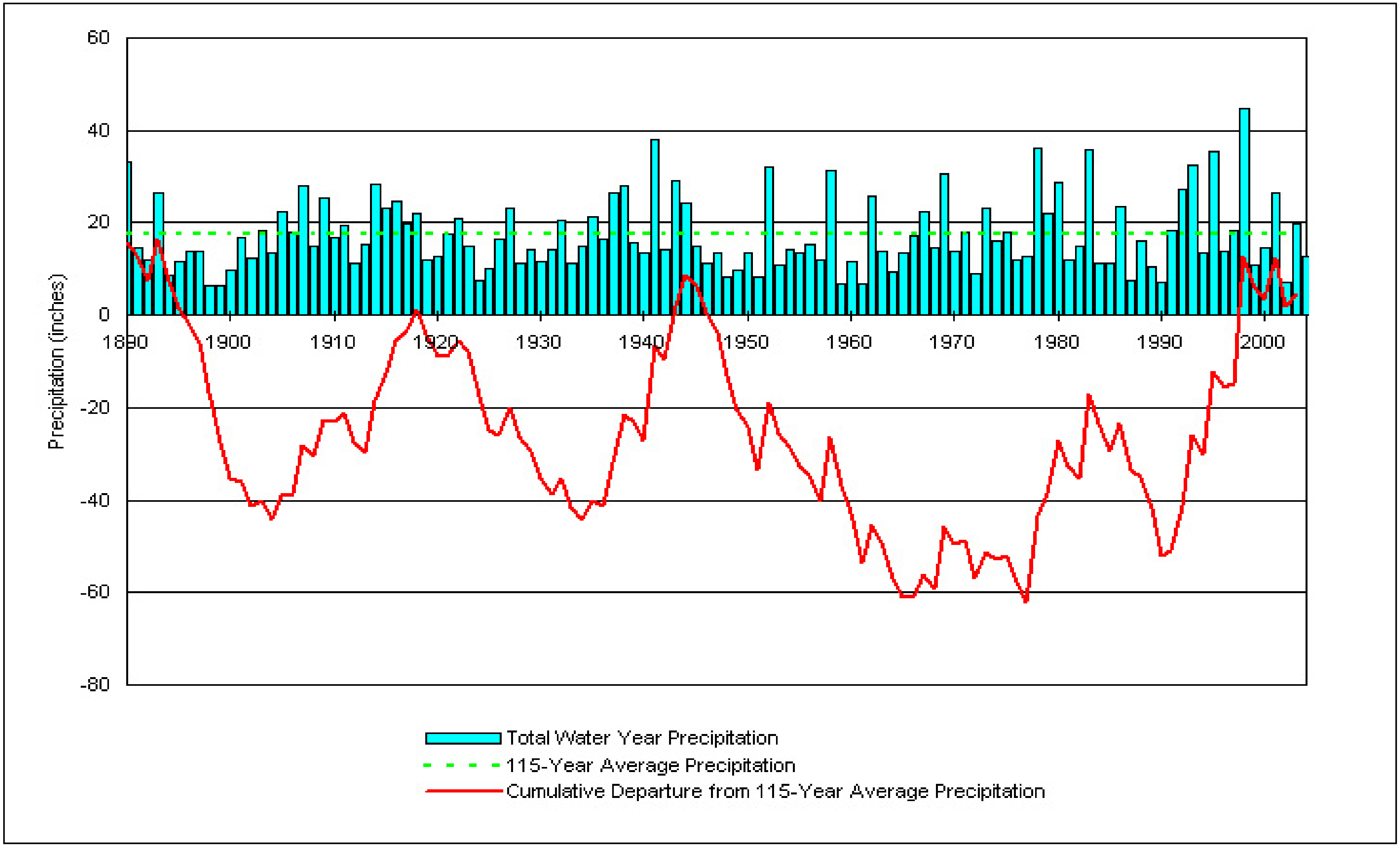
The four mutual water companies (Dempsey, Cypress, Saviers and Vineyard) all receive and deliver United's water without blending or further treatment.

5.1 Climate

The OH service area is on the Oxnard plain, which has a mild Mediterranean style climate, with cool, wet winters and mild, dry summers. Temperatures only rarely fall below freezing in the winter. Average rainfall in the Oxnard plain is around 13 inches per year, most of it falling from December through April. A higher quantity of rainfall falls in the mountains of the watershed, contributing to the local water supply. Historical rainfall in nearby Santa Paula is plotted in Figure 5-2.

Water demands can increase in late summer and fall during brief "Santa Ana" conditions, characterized by hot, dry winds. Occasional east winds in the fall also increase irrigation water demands for a few days at a time. During the few frost days, some growers use water to prevent their crops from freezing, increasing demands in those early mornings.

Figure 5-2
Historical Rainfall in Santa Paula



6.0 Description of the Oxnard-Hueneme Delivery System

6.1 OH Facilities

The OH System facilities supply drinking water to United's customers on the Oxnard Plain. A schematic of the OH facilities in El Rio is shown in Figure 6-1. The OH pipeline, along with other District facilities, is shown in Figure 6-2. The OH system includes the following major components:

Shallow wells: The OH system has nine shallow aquifer wells, located primarily around the perimeter of the El Rio spreading grounds. These wells include Wells Nos. 2A, 3, 4, 5, 6, 7, 8, 11, and 15. These wells are rather old, with most constructed using cable tool methods in the 1950s. Wells 2A and 11 are newer wells. These nine wells are perforated in the higher quality, upper aquifer system, which is directly recharged by surface water diverted from the Santa Clara River. Despite their age, these wells have performed well over the last 50 years, and maintain fairly high specific capacities. The wells are maintained by periodic replacements of pumps, column piping, tubing, electric motors and other components as necessary. From time to time the well casings are "shot" with low grade explosive charges to restore their specific capacities. There is some risk to this procedure and, in 2000, Well No. 2A partly collapsed and a section of the casing had to be relined. Acid treatment of the wells has not been successful in the past.

El Rio spreading grounds: All of the OH shallow wells except Well No. 11 are located immediately adjacent to the El Rio spreading grounds. Water diverted from the Santa Clara River at the Freeman Diversion is recharged into groundwater at El Rio via those spreading grounds. Although the spreading grounds are not part of the OH system, they have a big impact on its operation. While spreading operations are underway, the well water is similar in water quality to the river water. The river water used for recharge is usually of higher quality than ambient groundwater. When spreading has stopped for a few months, well water quality can decline. Tracer studies have shown that water recharged into the spreading ponds takes just a couple of days to migrate into the well production zones.

Deep Wells: In addition to the shallow aquifer wells, the OH system includes three deep aquifer wells constructed in the 1980's. These are Wells Nos. 12, 13 and 14, located along Rose Avenue. These wells are perforated in the deeper aquifer, separated from the shallow aquifer by a clay layer. Due to high iron and manganese in the groundwater pumped from these wells, they are used primarily as backup wells. These deep wells are operated under a waiver provided by the California Department of Health Services. This waiver was allowed after conducting a survey

OH Plant Facilities

Figure 6-1

UNITED WATER CONSERVATION

(Detail B)

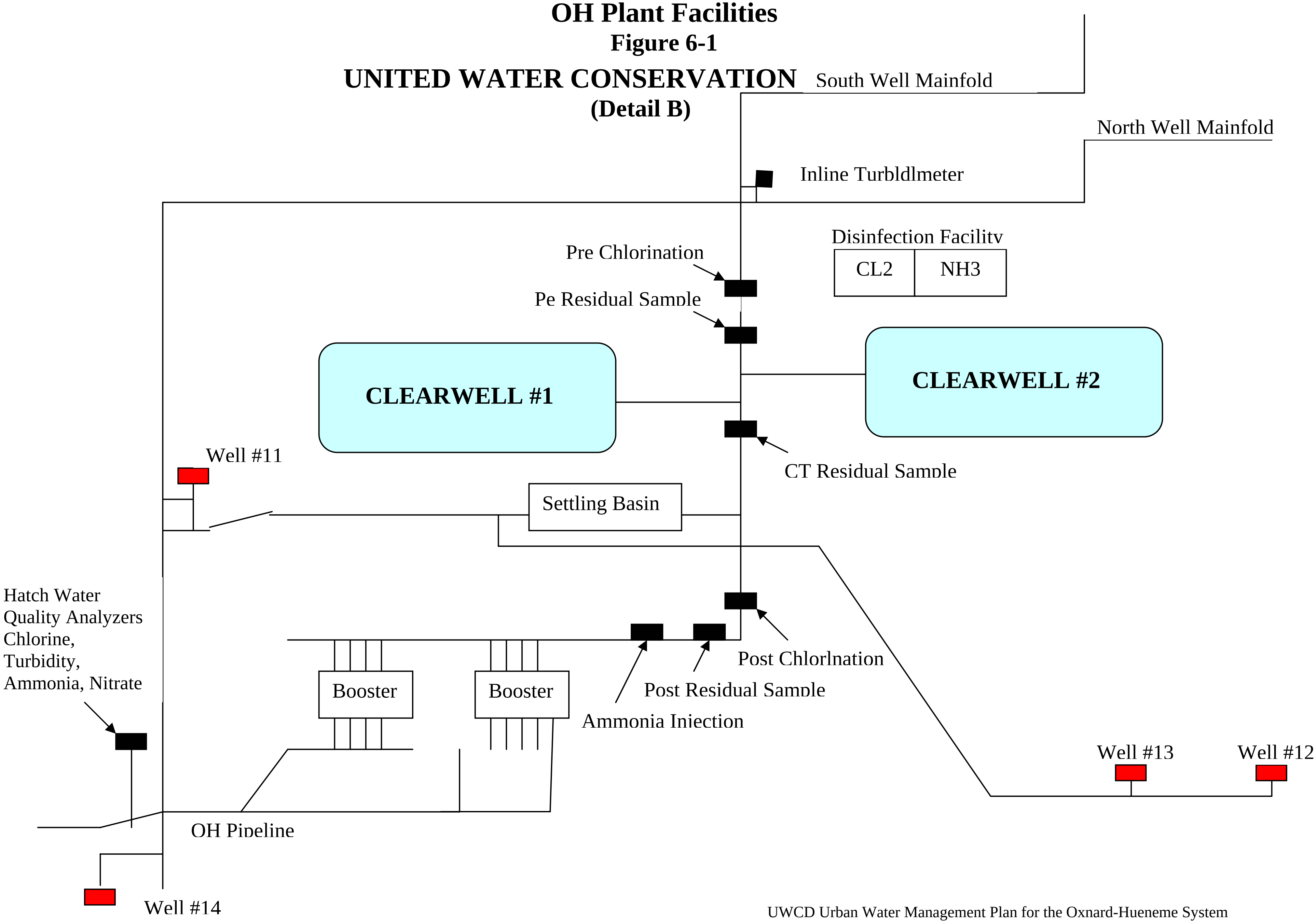
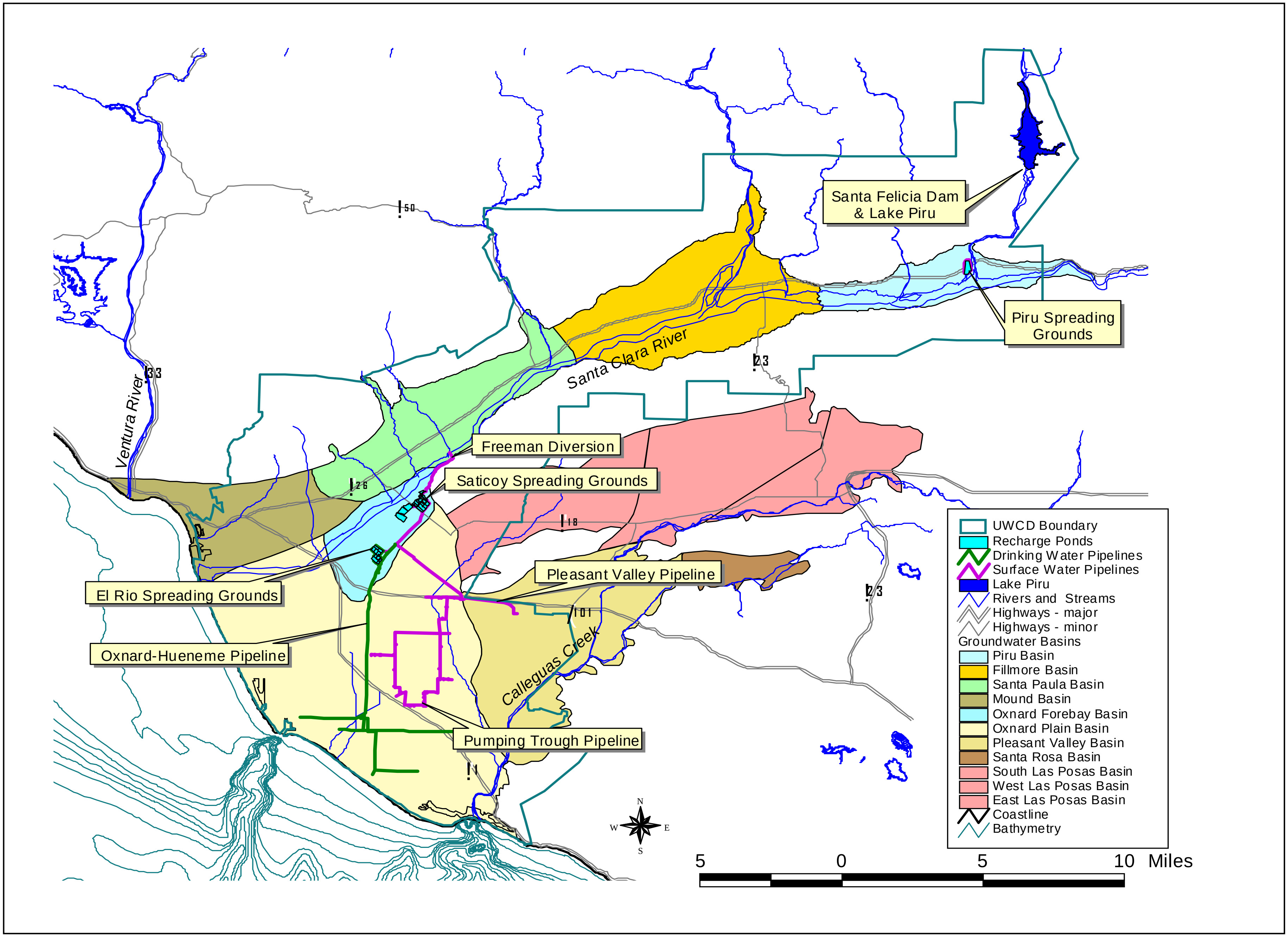


Figure 6-2
UWCD Facilities



of our OH customers, which must be done every seven years. The deep aquifer wells were used extensively in the 1985-1991 drought. However, they have not been used to supply OH water since 1992, except for one week during construction of the El Rio Improvements in 1997. They are maintained and tested periodically in preparation for any future drought.

OH Disinfection Facility: The disinfection building is a state-of-the-art facility constructed in 1998. It houses up to 8 one-ton cylinders of chlorine liquid/gas. After primary chlorination, ammonia is added, using a 19% aqueous ammonia solution. The disinfection residual is provided by chloramines, a combination of chlorine and ammonia. The chlorine building includes a scrubber system (caustic soda) to de-active any chlorine leaks, and backup power generation.

OH Clearwells: The OH system has two 8 million gallon clearwells (reservoirs), located near the disinfection building. Water pumped from the OH wells is stored in the clearwells before being repumped to customers. The clearwells are made with a plastic (polyethylene) lining and plastic floating cover. Having two clearwells provides redundancy for maintenance.

OH Electric Booster Plant: The OH booster plant pumps water from the OH clearwells into the OH pipeline. Water is delivered to OH customers on demand at a constant pressure (60 psi at the plant in El Rio). The pumps consist of four 400 HP electric-driven vertical turbine pumps. To accommodate rapid fluctuations in demand, the motors are driven by variable frequency drives (VFD's). One of the four pumps serves as a backup pump. In the event of a power failure (and a failure of the gas-driven pumps), water can be delivered by gravity from the clearwells into the OH pipeline.

OH Gas-Driven Booster Plant: Prior to construction of the electric-driven booster plant in 1997, water was pumped by natural-gas driven engines. There are four 400 HP natural-gas driven engines that run four centrifugal pumps, housed in a block building. The old booster plant is kept in service as a backup to the electric booster plant in case of power outages or mechanical failures. It also allows the District to participate in Demand Relief Programs, in which the electric-driven motors are turned off, upon request, during peak periods of electric power demands. The gas booster plant is operated under a permit from the Ventura County Air Pollution Control District (APCD).

El Rio Plant: The complex consisting of the two booster plants, the chlorine building, the clearwells, and associated office and shop buildings are commonly referred to as the El Rio Plant.

OH Pipeline: The OH pipeline includes 12 miles of varying diameter cement-mortar lined and coated steel pipes, starting at 54-inches in diameter at the OH plant in El Rio, and tapering to 16-inches at the furthest reach. There are no individual retail customers on the OH pipeline (except for one farmhouse). Instead, large turnouts are provided to retail water agencies.

750 KW Generator: The OH system includes a 750 KW backup generator. In the event of a massive power failure, this generator will power the OH shallow wells for direct delivery to customers.

SCADA System: The SCADA System (Supervisory Control and Data Acquisition) is the automated control system that monitors and operates United's facilities, including the OH System. Routine checks and adjustments are made by the SCADA system. The system includes telephone dial-out so that operators can be called 24-hours a day in the event of emergencies or alarm conditions. Alarm conditions include low chlorine residuals, mechanical failures, low system pressures, power outages, and over 500 different things that can go wrong. United is in the middle of a conversion to a new SCADA system, based on Allen-Bradley components.

6.2 OH Design Capacities

The OH System is designed to deliver a peak flow of 53 CFS to its customers, via the OH pipeline. That capacity is based on maintaining a pressure of 60 psi at the booster plant, and providing adequate flow pressures at our customers' turnouts. In practice, the pressure provided to our customers exceeds their needs. For example, Oxnard reduces the OH line pressure at their blending stations. PHWA uses a pressure reducing valve to decrease the line pressure before treatment. A detailed hydraulic analysis has not been done to determine whether the OH deliveries could be increased within the limits of the existing pipeline pressure capacities.

The OH wellfield has a combined capacity of about 73 CFS, as detailed in Table 6-1. In general, there is surplus well capacity in the wellfield, which is needed for blending and backup purposes.

6.3 Treatment methods

Due to the proximity between the OH shallow wells and the El Rio spreading grounds (within 25 feet in places), the shallow wells are considered to be "groundwater under the influence of surface water." This means that the requirements of the Surface Water Treatment Rule (SWTR) are applicable. Previous particulate analyses of the well water indicate that the surface water effects are largely attenuated by filtration of the surface water through the soil between the time it is spread and the time it reaches the wells. This "natural filtration" has many benefits and is used in Europe to provide filtration of surface water. Some researchers argue that natural filtration is superior to conventional filtration. For purposes of the SWTR, California DHS considers the natural filtration of the OH wellfield to be equivalent to slow sand filtration, and credits the system with 2 logs removal via filtration (99% of Giardia-size pathogens removed).

OH WELL CHARACTERISTICS
Table 6-1

Well No.	Source Aquifer	Well Depth (feet)	Well (1) Capacity (gpm)	Pump Bowl Depth (feet)	Driver Size (hp)	DRIVER TYPE
2A	UAS	320	2755	176	100	U.S. Electric Motor
3	UAS	303	2238	155	100	U.S. Electric Motor
4	UAS	303	2270	155	100	U.S. Electric Motor
5	UAS	303	2482	177	100	U.S. Electric Motor
6	UAS	301	2318	187	100	U.S. Electric Motor
7	UAS	326	2195	177	100	U.S. Electric Motor
8	UAS	314	2743	187	100	U.S. Electric Motor
11	UAS	360	3336	163	150	U.S. Electric Motor
12	LAS	1112	2676	478	400	Westinghouse Softstart
13	LAS	1418	2944	351	300	Westinghouse Softstart
14	LAS	1470	3367	387	500	Westinghouse Softstart
15	UAS	330	3500	192	150	U.S. Motor and Allen-Bradley Softstart

Notes:
(1) As of October 1992
* Inactive well
UAS = Upper Aquifer System
LAS = Lower Aquifer System

The SWTR requires surface water to be disinfected for a sufficient contact time to kill viruses and pathogens. Primary disinfection for the OH system is provided by chlorine, before the addition of ammonia. The OH clearwells include baffles to force the water to flow around a circuitous path, providing sufficient contact time in the reservoir to meet the requirements of the SWTR. The monitoring requirements of the SWTR are followed to ensure that sufficient contact time is obtained. Monthly reports on the treatment results are provided to DHS.

After the chlorinated water leaves the clearwells, ammonia is injected into the water to form chloramines, a long-lasting disinfection residual. Chloramination is used because of the reduced tendency to form trihalomethanes and other organic decay byproducts that can cause cancer. Chloramines are also longer lasting, and are compatible with the chloraminated water used by the two largest OH customers, Oxnard and PHWA.

Water from the deep aquifer wells is high in iron and manganese. When those wells are pumped, a sequestering agent, Aqua-Mag, is added to the well water to sequester the iron and manganese. Such sequestering reduces the aesthetic impacts of water high in iron and manganese.

6.4 Groundwater Recharge Facilities

Although they are not part of the OH System, United's groundwater recharge facilities contribute to the groundwater supply pumped from the OH wells. The Freeman diversion is a roller compacted concrete (RCC) dam on the Santa Clara River in Saticoy. Up to 375 CFS of river water is diverted there into canals, which carry the water to the spreading grounds, including the El Rio spreading grounds adjacent to the OH wellfield. After the water is filtered at a microscreen facility in Saticoy, the diverted water is conveyed to El Rio through a buried pipeline along Rose Avenue,.

6.5 Operations Staff

The OH System is operated by a highly trained and competent staff. The OH system is rated by DHS as a T4/D4 system, which requires certified Grade 4 operators for the treatment system and certified Grade 4 distribution system operators. The District presently has four Grade 4 treatment operators on staff.

The OH System is monitored 24-hours a day by operations staff. Each week, one of six operators is assigned "rotating shift" duty, during which they are on call to respond to alarms and emergencies. While on call, they carry pagers and cell phones which are automatically called by the SCADA system with verbal notification of any alarm conditions. For example, they might receive a call with a voice message "low chlorine levels in the clearwell." The operators can query the system remotely and decide whether they need to respond to the emergency. They are able to respond to emergencies within a 30-minute period.

7.0 Present and Future Population Served

Information on the local population served is shown in Table 7-1. The OH System serves a population of about 180,000 people. That number is expected to increase to around 215,000 people by 2020. However, the water deliveries for the OH System are set by contract, and will not be affected by future population growth.

8.0 Water Supply

The water supply for the OH system is provided solely by local groundwater, pumped from the 12 OH wells. Groundwater is recharged by the Santa Clara River, by some direct percolation of rainfall in limited areas, and by United Water's groundwater recharge operations.

8.1 Oxnard Plain Groundwater Basins

The aquifers within United's boundaries, including the Oxnard Plain aquifers, are shown on Figure 8-1. A generalized cross section of the aquifers is shown in Figure 8-2. There are several aquifers at varying depths in the Oxnard Plain The OH wells are located in the part of the aquifer system called the Oxnard Forebay, or the Montalvo Forebay. The Forebay is an important part of the aquifer system, where the aquifers come together and are unconfined. The Forebay is recharged from the Santa Clara River in its riverbed and by river water that is diverted to United's spreading basins. In areas outside the Forebay, the aquifers are covered by a confining clay layer. The Forebay is hydraulically connected to the other aquifers in the Oxnard Plain basin. Thus, the primary recharge to the Oxnard Plain basin is from underflow from the Forebay rather than from deep percolation of water from surface sources on the plain. In some areas of the Oxnard Plain, a semi-perched aquifer sits above the confining clay; this perched water is of poor quality and is not used as a water supply.

The groundwater levels in the Oxnard Plain aquifers change considerably from year to year depending on drought and pumping levels. The historical water levels in key wells are shown in Figure 8-3.

8.2 Strategy for Recharging the Oxnard Plain Aquifers

The strategy of United's groundwater recharge operation is to recharge surface water from the Santa Clara River into two spreading grounds and a mined gravel pit in the Oxnard Forebay. These grounds include the Saticoy spreading grounds northeast of Highway 118 and the El Rio Spreading grounds at the El Rio plant. Near the Saticoy spreading grounds is the Noble pit, a former gravel pit mined of its aggregate, and now converted to recharge basins. Water recharged in these facilities migrates over time into the other Oxnard Plain aquifers towards the coast.

Another element in United's recharge operations is the supply of surface water to farms in the eastern Oxnard Plain. This surface water reduces pumping in the critical eastern part returned to artesian conditions, flowing water above the ground. By contrast, during drought periods, groundwater can drop to critical levels.

Table 7-1
Population & Demographic Characteristics: 2000

Table DP-1. Profile of General Demographic Characteristics: 2000
Geographic Area: Ventura County, California

[For information on confidentiality protection, nonsampling error, and definitions, see text]

Subject	Number	Percent
Total population	753,197	100.0
SEX AND AGE		
Male	375,988	49.9
Female	377,209	50.1
Under 5 years	56,231	7.5
5 to 9 years	63,350	8.4
10 to 14 years	60,126	8.0
15 to 19 years	55,677	7.4
20 to 24 years	46,380	6.2
25 to 34 years	104,166	13.8
35 to 44 years	126,980	16.9
45 to 54 years	102,747	13.6
55 to 59 years	34,854	4.6
60 to 64 years	25,882	3.4
65 to 74 years	40,244	5.3
75 to 84 years	27,271	3.6
85 years and over	9,289	1.2
Median age (years)	34.2	(X)
18 years and over	538,953	71.6
Male	266,134	35.3
Female	272,819	36.2
21 years and over	507,972	67.4
62 years and over	91,529	12.2
65 years and over	76,804	10.2
Male	32,416	4.3
Female	44,388	5.9
RACE		
One race	723,624	96.1
White	526,721	69.9
Black or African American	14,664	1.9
American Indian and Alaska Native	7,106	0.9
Asian	40,284	5.3
Asian Indian	4,123	0.5
Chinese	6,343	0.8
Filipino	15,548	2.1
Japanese	4,840	0.6
Korean	3,309	0.4
Vietnamese	3,308	0.4
Other Asian [1]	2,813	0.4
Native Hawaiian and Other Pacific Islander	1,671	0.2
Native Hawaiian	394	0.1
Guamanian or Chamorro	327	-
Samoan	559	0.1
Other Pacific Islander [2]	391	0.1
Some other race	133,178	17.7
Two or more races	29,573	3.9
Race alone or in combination with one or more other races: [3]		
White	552,424	73.3
Black or African American	18,240	2.4
American Indian and Alaska Native	13,270	1.8
Asian	48,856	6.5
Native Hawaiian and Other Pacific Islander	3,502	0.5
Some other race	148,362	19.7

Subject	Number	Percent
HISPANIC OR LATINO AND RACE		
Total population	753,197	100.0
Hispanic or Latino (of any race)	251,734	33.4
Mexican	211,925	28.1
Puerto Rican	2,286	0.3
Cuban	1,043	0.1
Other Hispanic or Latino	36,480	4.8
Not Hispanic or Latino	501,463	66.6
White alone	427,449	56.8
RELATIONSHIP		
Total population	753,197	100.0
In households	739,985	98.2
Householder	243,234	32.3
Spouse	144,778	19.2
Child	246,465	32.7
Own child under 18 years	187,911	24.9
Other relatives	58,900	7.8
Under 18 years	20,506	2.7
Nonrelatives	46,608	6.2
Unmarried partner	12,355	1.6
In group quarters	13,212	1.8
Institutionalized population	4,668	0.6
Noninstitutionalized population	8,544	1.1
HOUSEHOLD BY TYPE		
Total households	243,234	100.0
Family households (families)	182,959	75.2
With own children under 18 years	96,626	39.7
Married-couple family	144,778	59.5
With own children under 18 years	75,382	31.0
Female householder, no husband present	26,528	10.9
With own children under 18 years	15,085	6.2
Nonfamily households	60,275	24.8
Householder living alone	45,931	18.9
Householder 65 years and over	17,993	7.4
Households with individuals under 18 years	106,140	43.6
Households with individuals 65 years and over	54,516	22.4
Average household size	3.04	(X)
Average family size	3.46	(X)
HOUSING OCCUPANCY		
Total housing units	251,712	100.0
Occupied housing units	243,234	96.6
Vacant housing units	8,478	3.4
For seasonal, recreational, or occasional use	2,653	1.1
Homeowner vacancy rate (percent)	0.9	(X)
Rental vacancy rate (percent)	2.6	(X)
HOUSING TENURE		
Occupied housing units	243,234	100.0
Owner-occupied housing units	164,380	67.6
Renter-occupied housing units	78,854	32.4
Average household size of owner-occupied units	3.03	(X)
Average household size of renter-occupied units	3.08	(X)

- Represents zero or rounds to zero. (X) Not applicable.
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more of the other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000.

Table 7-1

Figure 8-1
Groundwater Basins within United Water

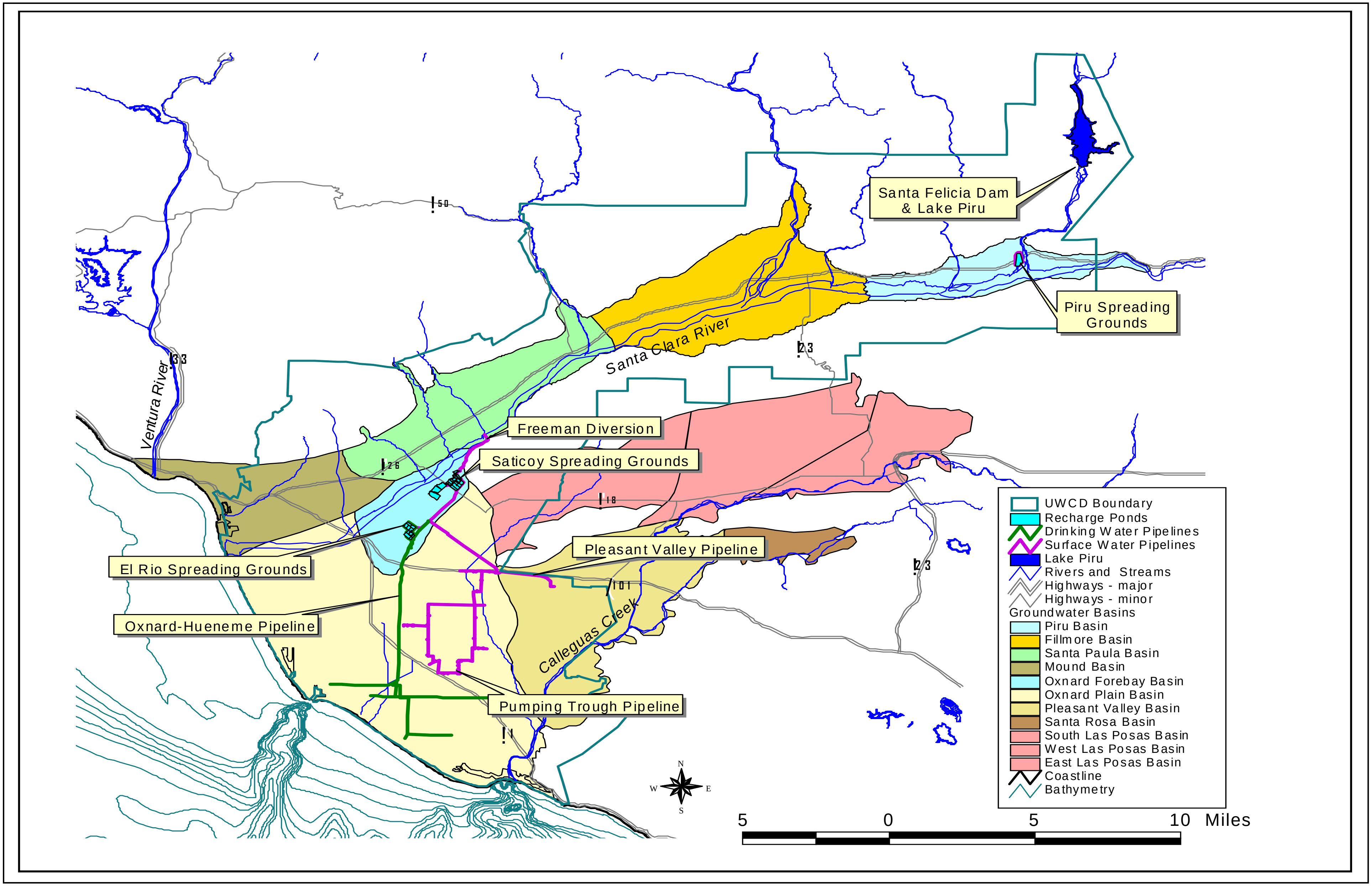


Figure 8-2
Cross Section of the Oxnard Plain Aquifers

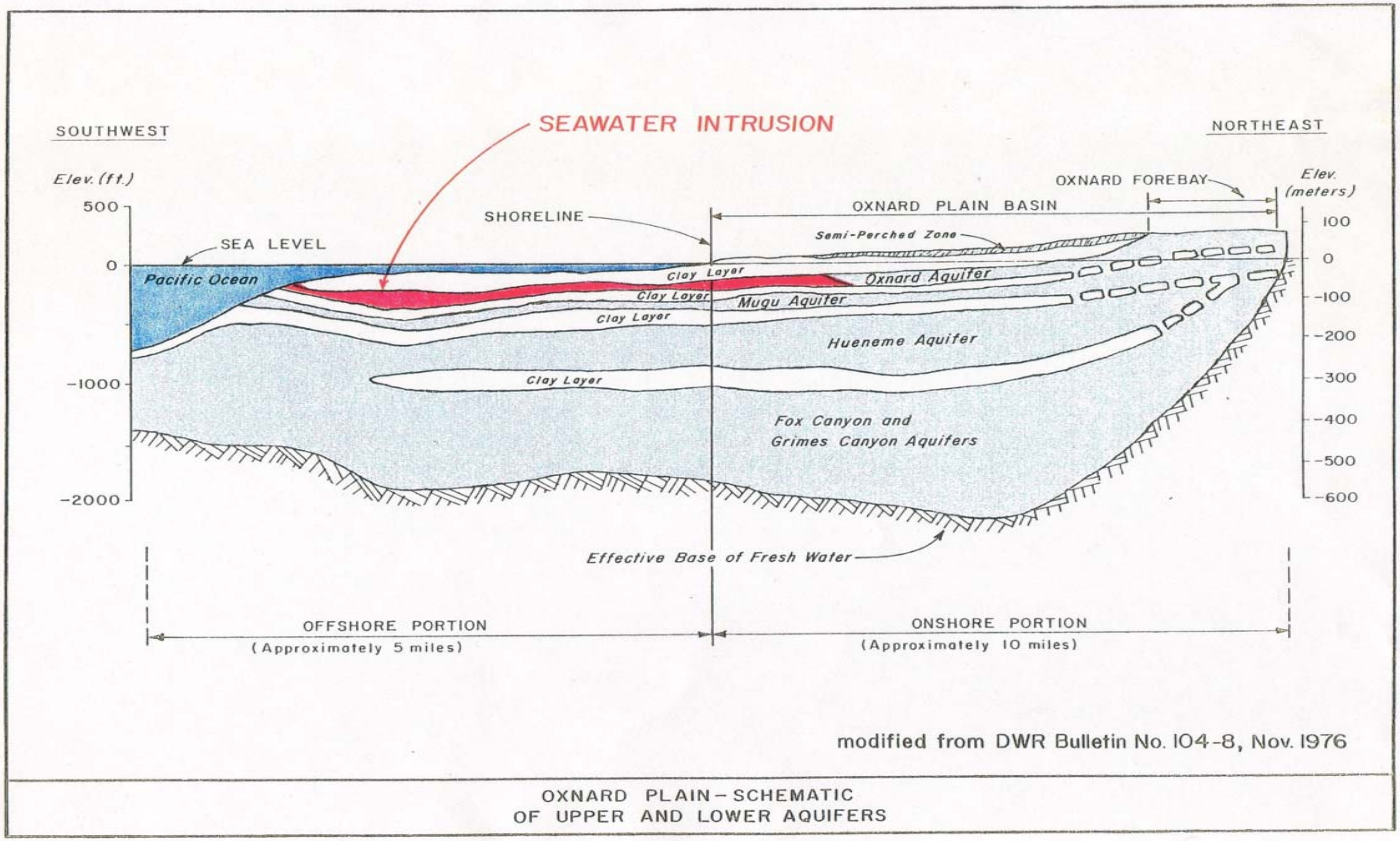


Figure 8-3
Historical Groundwater Levels in Key Wells

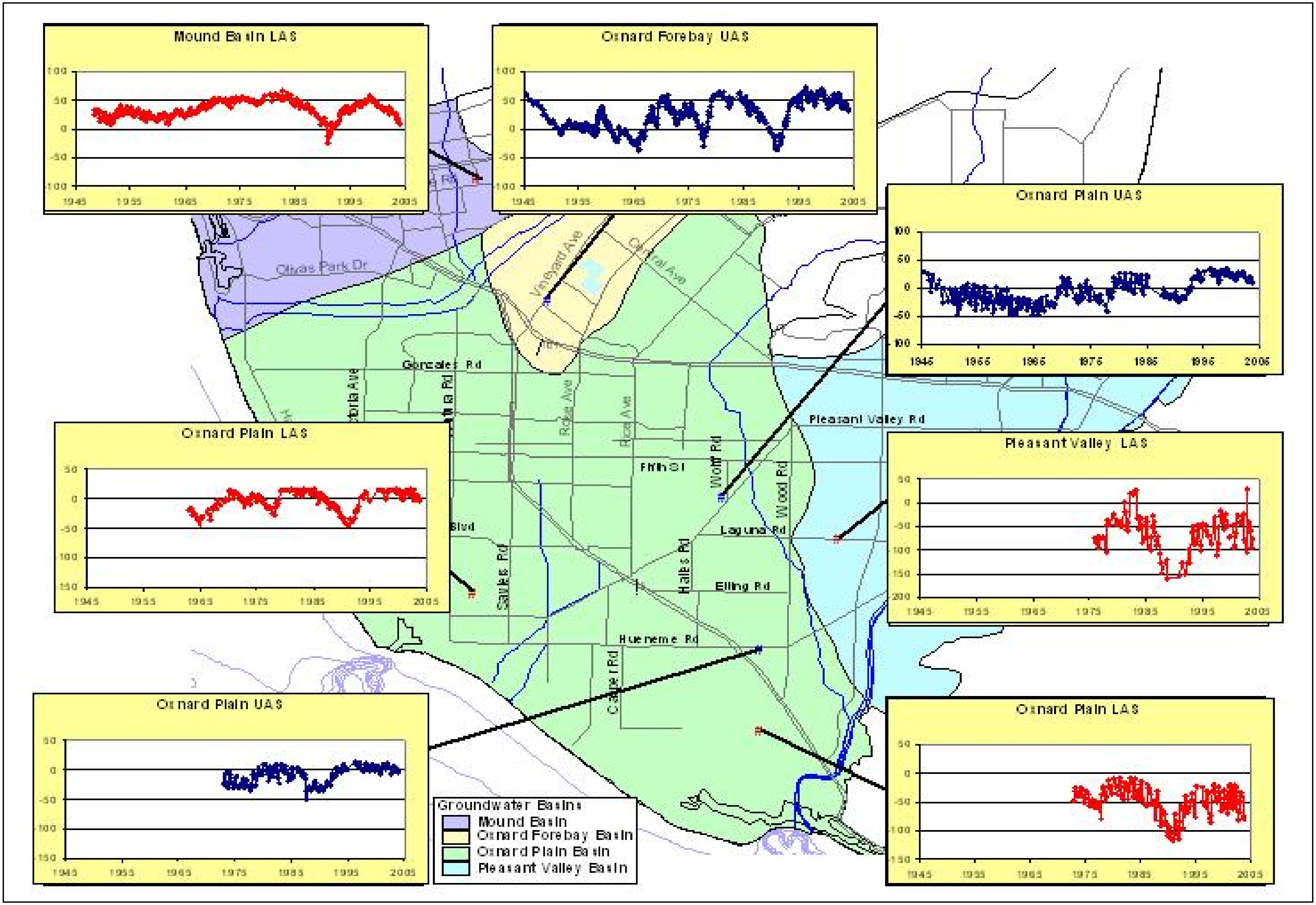
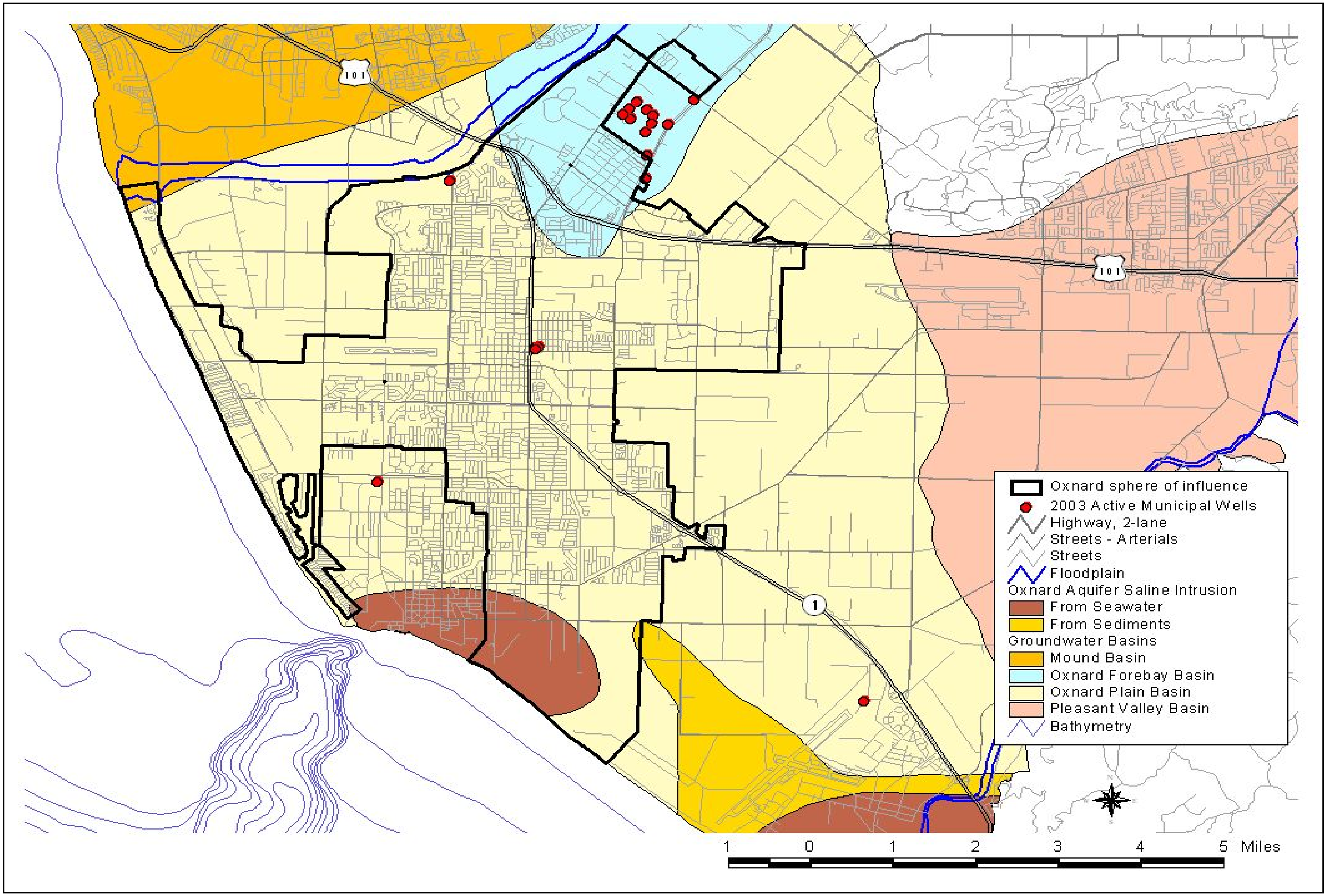


Figure 8-4
OH System Moves Pumping Inland



of the aquifer system, providing "in-lieu" groundwater recharge. (Water that is not pumped is left in the ground for future use.)

Grant conditions provided to United by the State Water Resources Control Board also place limits on how the groundwater basin are operated. These conditions are provided in Appendix C. Once the groundwater level in the Oxnard Forebay falls below a preset critical level, recharge operations have priority over agricultural irrigation, and the deep aquifer wells must be pumped in preference to the shallow aquifer wells. This condition does not affect the OH water supply, but it does affect the quality of the water delivered. However, in a water supply emergency, water deliveries to the OH System would have a higher priority than the grant conditions, to protect human health.

8.3 Moving Pumping Inland

The primary purpose of constructing the OH System in the 1950s was to move pumping inland, away from the coast, as illustrated in Figure 8-4. As seawater encroached into the aquifers near the coastline, it threatened the water supply of urban areas. There are hydrogeological benefits to moving pumping inland, closer to the points of recharge. More water can be pumped from those locations without drawing groundwater levels below sea level, which draws seawater into the aquifers. Those hydrogeologic benefits remain valid today. It is important for the OH System remain viable and cost-effective, so that the OH Customers will continue to use OH water instead of their own wells. The GMA allocation of the OH wellfield (discussed below) provides such an incentive.

8.4 Surface Water Availability

Closely related to the availability of groundwater is the availability of surface water in the Santa Clara River, used to recharge the Oxnard Plain aquifers. The Santa Clara River carries high flows in most winters, but nearly stops flowing in the late summer. Peak flows in large winter storms have exceeded 140,000 CFS. By late summer, those flows usually recede to a range of 5-20 CFS. In some years, the river has dried up completely by late summer. That has not happened since the last drought, before the construction of the improved Freeman diversion; and it remains to be seen whether the improved Freeman diversion will dry up in droughts, given higher wastewater production upstream in the watershed.

Surface water flows can vary considerably from year to year. United's operating strategy is to spread as much water as possible in wet years. Although groundwater levels in the Oxnard Plain can respond rapidly to a wet year, the normal trend is for groundwater levels to gradually change over a multiple-year period in response to changing hydrologic conditions. After the wet year of 1995, many wells in the Oxnard Plain temporarily

The amount of groundwater in storage in the Oxnard Plain is far greater than the annual pumping demands placed on it. Water stored underground allows United's constituents, including OH customers, to continue using water during dry periods.

8.5 Lake Piru Operations

In addition to its groundwater recharge facilities, United Water owns and operates Lake Piru. Winter storm runoff is stored in the lake for later release downstream. In the late summer or early fall, water is released from Lake Piru at a high flow of 400 to 600 CFS. Typically around 10,000 to 50,000 AF of water is released downstream each year. Average releases are some 27,000 AF per year. Some of that water reaches the Freeman diversion 26 miles downstream, and is used to recharge the Oxnard Plain. Since the Oxnard plain aquifers are in a state of overdraft, United's operating priority is to convey as much water as possible to the Freeman diversion each year. However, the upstream groundwater basins (the Piru basin, Fillmore basin, and Santa Paula basin) naturally percolate some of the water released each year. The percentage of water reaching the Freeman diversion from Lake Piru has varied from about 20% to almost 90%, depending on many factors.

In the past, United Water has exercised its option to perform an early release from Lake Piru when high nitrates threatened the OH wellfield. That option remains available for any future water quality emergencies in the OH wellfield.

8.6 Overdraft of the Oxnard Plain Aquifers

The construction of the improved Freeman diversion has helped bring the upper aquifer into balance. Seawater intrusion has been at least partly reversed in the upper aquifer. However, the deep aquifer system is still being "mined." Extractions exceed recharge by approximately 20,000 AF/Yr. What this means is that the seawater intrusion front for the deep aquifers has advanced onshore in some areas. Thus, current groundwater management strategies deal with intrusion of both the upper and lower aquifers.

8.7 Minimizing Imported Water

Some OH customers also receive water from Calleguas MWD. That water is imported from Northern California. To the extent that those customers utilize OH water, that amount of water does not need to be imported into Ventura County.

9.0 Historic Water Demands

Historic water demand on the OH system are listed in Table 9-1, and plotted in Figure 9-1.

Historic water use from the deep aquifer wells is summarized in Table 9-2. As can be seen, those wells are only used in drought conditions.

United Water Conservation District

Historical OH Water Demand
Table 9-1

Calendar Year	Total OH Water Usage (AF)
1984	14,588
1985	14,445
1986	13,884
1987	14,501
1988	14,270
1989	14,457
1990	14,757
1991	12,644
1992	12,699
1993	14,978
1994	13,093
1995	8,666
1996	6,881
1997	17,776
1998	16,785
1999	17,673
2000	14,122
2001	13,339
2002	14,920
2003	16,761

Note: In 1995 and 1996, Oxnard took less OH water than usual because of a low-cost Calleguas MWD water program.

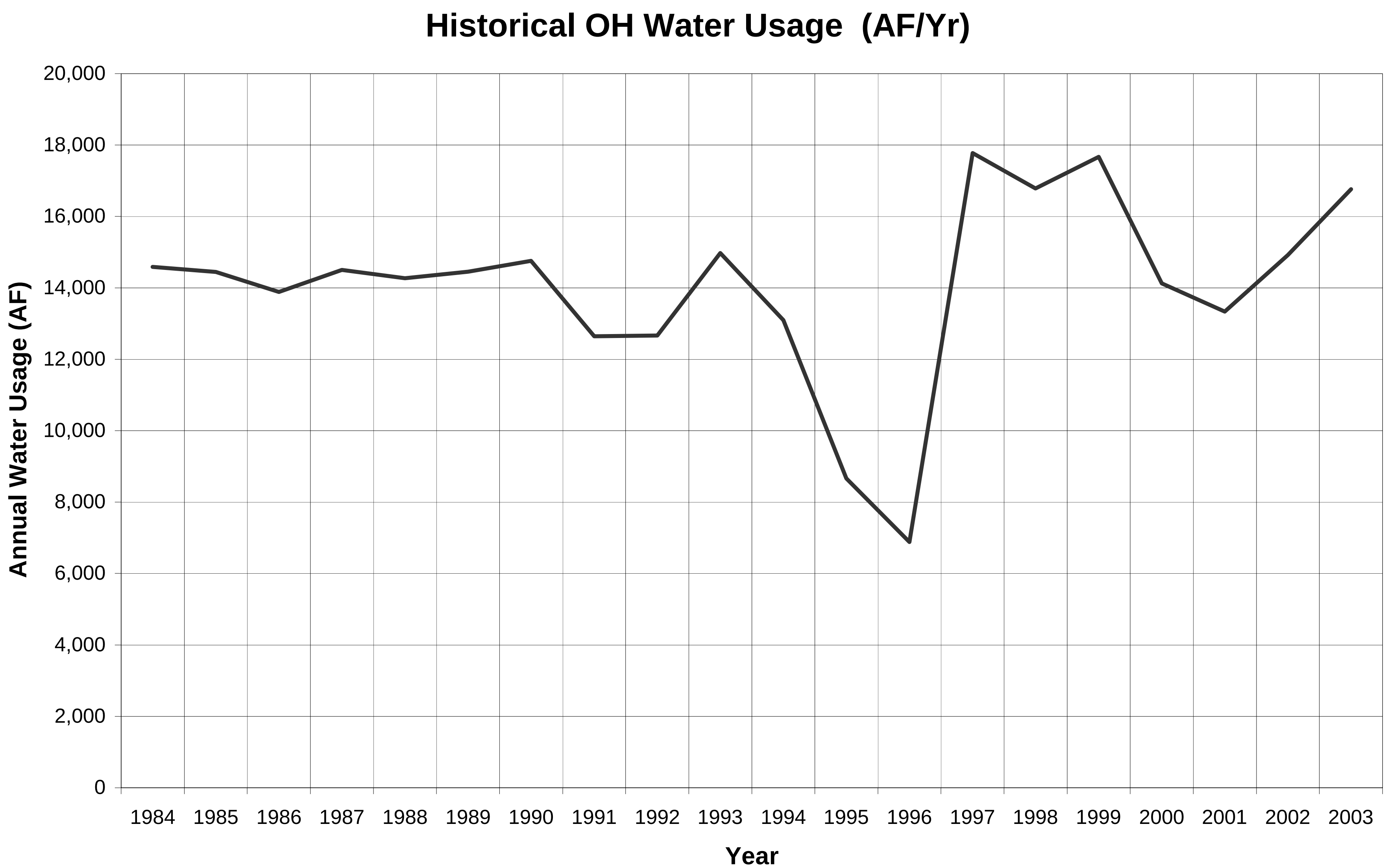

Historical OH Water Usage (AF/Yr)
Annual Water Usage (AF)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

Figure 9-1

United Water Conservation District

OH Deep Aquifer Well Pumping History
Table 9-2

Calendar Year	Deep Aquifer Pumping (AF)
1984	0
1985	0
1986	2
1987	564
1988	43
1989	711
1990	2,796
1991	1,597
1992	97
1993	206
1994	67
1995	28
1996	33
1997	62
1998	168
1999	12
2000	91
2001	18
2002	793
2003	10

Note: In 2002, deep aquifer wells were pumped to the irrigation pipeline (Not part of the OH System).

The OH System is operated under an agreement between United Water and the OH Customers. In that agreement, each customer is assigned an annual allocation for OH water, and a maximum flow rate at which water can be received. A list of OH customers and their contract amounts for OH water is provided in Table 9-3.

In practice, peak flows to each customer are not metered. There is no way to know whether a customer is exceeding its peak flow capacity. Fortunately, total peak flows leaving the OH plant, which are metered, have not exceeded the total design capacity of 53 CFS. In fact, peak flows have been reduced since PHWA's treatment plant has gone on line. If problems with peak flows were to occur, it would be feasible to install peak flow meterheads and require the OH customers to remain within their limits.

10.0 Water Demand Management

10.1 Fox Canyon GMA

The Fox Canyon Groundwater Management Agency (GMA) was formed by Act 2750, passed by the California Legislature, to monitor and control pumping within the GMA boundaries, shown in Figure 10-1. To fund its activities, the GMA collects an annual charge (per acre-foot of pumped water) from all pumpers within its boundaries. The GMA has the authority to pass ordinances to control the pumping of groundwater in its service area. GMA Ordinance 5 (now replaced by Ordinance 8) controls the amount of water that can be pumped from the Oxnard Plain and Las Posas area. Each pumper is assigned a historical allocation based on his 1985-1989 pumping from each well. Pumping is to be cut back 5% every five years, up to a maximum reduction of 25% in 2010. The cutbacks required by year are summarized in Table 10-1. The 2005 cutbacks have been delayed by a year for further study.

The GMA cutbacks were originally intended to bring the upper aquifer into balance by the year 2010. A pumper can build up GMA "credits" if he pumps less than his allocation in any given year. However, if a pumper runs out of credits and pumps in excess of his reduced annual pumping allocation, he will be assessed a GMA penalty for each AF of excess water pumped. The GMA penalty is presently set at $725 per AF, which is considered to be the cost of purchasing imported water.

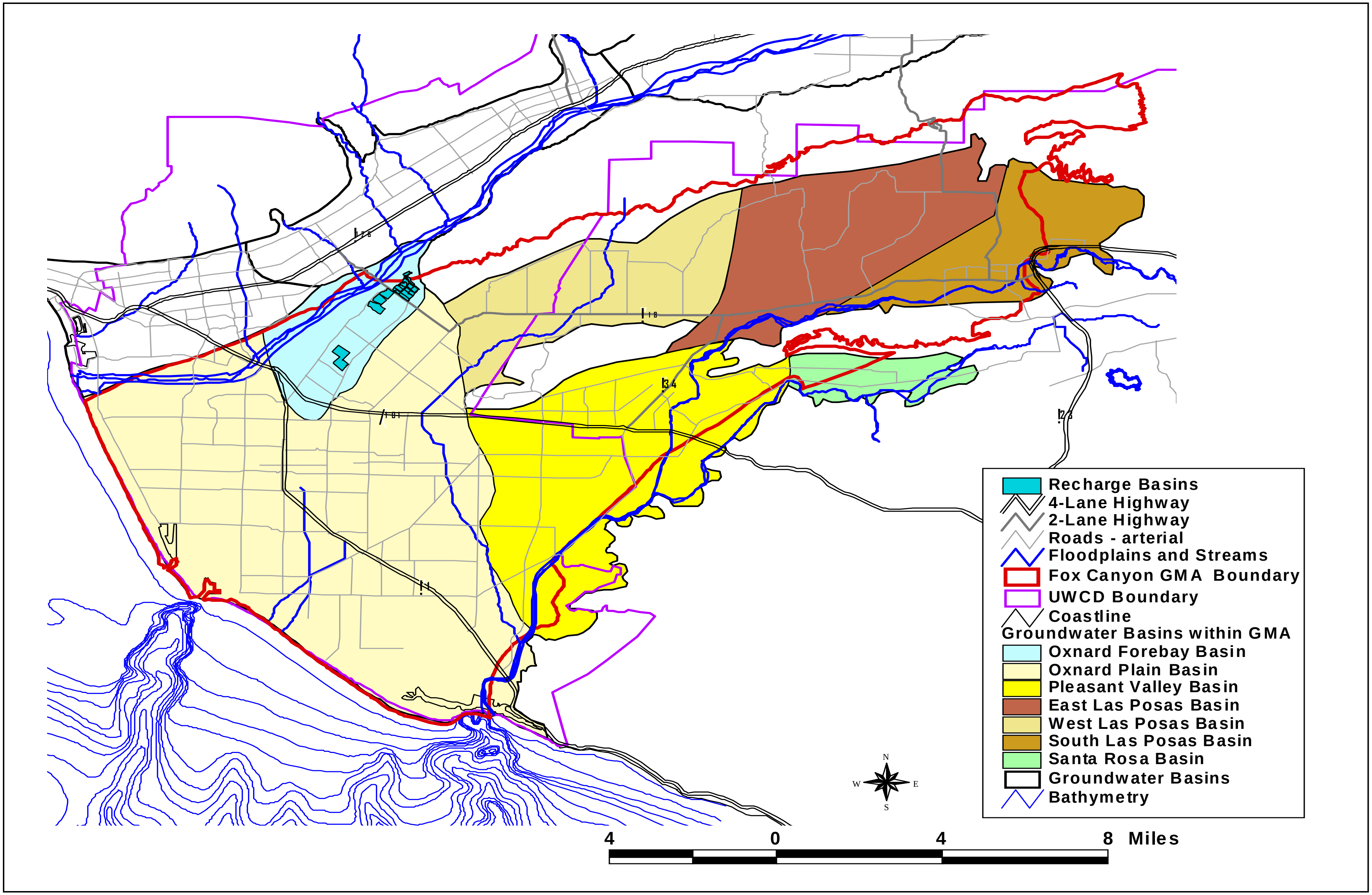
10.2 Groundwater Management Plan

Both United Water and the GMA operate under the guidelines of a groundwater management plan prepared by the GMA. A copy of the plan is provided in Appendix A.

OH Customer Sub-allocations
Table 9-3

OH Customer	OH Sub-Allocation (AF)
City of Oxnard	
Oxnard	6,237.78
Ocean View MWD	2,729.55
Oxnard SUBTOTAL	**8,967.33**
Port Hueneme Water Agency	
Port Hueneme	3,593.18
NAWS Point Mugu	899.19
USN CBC	120.18
Channel Islands Beach CSD	0.00
PHWA SUBTOTAL	**4,612.55**
Mutual Water Companies	
Cypress Mutual	96.20
Dempsey Road Mutual	194.47
Saviers Road Mutual	27.57
Vineyard Avenue Estates	266.00
Mutual SUBTOTAL	**584.24**
Other OH Customers	
Donions Recharge	5.25
Kunho (Del Norte)	9.50
Rio Del Valle Schools	26.70
Ventura Co Game Preserve	1.28
Other Customer SUBTOTAL	**42.73**
TOTAL OH SUBALLOCATIONS	**14,206.85**

Figure 10-1
GMA Boundaries



GMA Pumping Reductions by Year
Table 10-1

Years	Reduction Required	Pumping Allowed
1991	None	100%
1992-1994	5%	95%
1995-1999	10%	90%
2000-2004	15%	85%
2005-2009	20%	80%
2010 and beyond	25%	75%

OH Historical GMA Allocation
Table 10-2

Source	Historical Allocation (AF/Yr)	Year Effective
OH Pumping 1985 – 1989	14,673.628	1991
Noble Pit allocation transfer	203.428	1994
Transfer from Vineyard Avenue Estates	266.000	1997
Transfer from Rio Del Valle Schools	26.700	1997
TOTAL OH HISTORICAL ALLOCATION	**15,169.756**	

10.3 Water Demand Management

The OH wellfield is subject to the same pumping limitations and GMA penalties as any other pumpers. The total available GMA allocations for the OH wellfield are summarized in Table 10-2.

The GMA pumping limitations and penalties provide a very strong incentive for OH customers to reduce their pumping. Each OH customer has an allocation as listed in Table 9-3. By the terms of the OH Agreement, each customer's allocation is referred to as that customer's suballocation. If a customer pumps more than his reduced suballocation, then that customer is liable for any GMA penalties that may accrue. There are provisions in the OH Agreement for payment in advance to cover penalties for over-pumping. At an additional cost of $725 per AF, OH customers are encouraged to conserve water and use other sources that may be available.

10.4 Projected Water Demands

Projected water demands for the OH System are estimated in Table 10-3. These demands are based on customers staying within their GMA suballocation, including reductions. To the extent that these projections are ever exceeded, additional funds should be available, through GMA penalties, to import additional water supplies into Ventura County.

11.0 Water Quality Issues

11.1 Blending of OH Wells

The major water quality problem for the OH system is the occasional presence of high nitrate levels in some of the shallow aquifer wells. The OH wellfield is surrounded by strawberry fields, which are fertilized with nitrate-based fertilizer. There are also domestic septic systems in the El Rio area, both for individual residences and for institutions like Rio Mesa High School. It is thought that septic systems and agriculture contribute about equally to the nitrate problem. Since El Rio is located within the Oxnard Forebay, both fertilizers and leached wastewater percolate easily into the drinking water aquifer.

Typically, nitrates are low in the winter and spring, while surface water from the Santa Clara River is being recharged into the El Rio spreading grounds. The river water is usually low in nitrates, normally well under 10 mg/L; and that water strongly influences the wells. Normally, surface spreading stops around June of each year, due to reduced river flows. After that point, nitrate levels in some wells may increase. The increase is usually gradual, but sudden jumps in nitrate levels are frequently observed. It is not uncommon for one or more wells to exceed the Maximum Contaminant Level (MCL) for

United Water Conservation District

Projected OH Water Demands
Table 10-3

Year	Total Pumping (AF/Yr)	GMA Reductions
2005	12,140	85%
2006	12,140	80%
2007	12,140	80%
2008	12,140	80%
2009	12,140	80%
2010	11,380	75%
2011	11,380	75%
2012	11,380	75%
2013	11,380	75%
2014	11,380	75%
2015	11,380	75%
2016	11,380	75%
2017	11,380	75%
2018	11,380	75%
2019	11,380	75%
2020	11,380	75%
2021	11,380	75%
2022	11,380	75%
2023	11,380	75%
2024	11,380	75%
2025	11,380	75%

nitrate of 45 mg/L. Nitrate levels in each OH well are sampled and analyzed once a week, and nitrate levels are watched closely. When a well begins to approach the MCL, it is either not used, or is placed at the bottom of the call-on list; so that it is the last well called upon to meet demand. All of the OH wells feed into a common manifold near the chlorine building. This allows a blending operation which results in a delivered nitrate level within the MCL. To provide an emergency warning capability, there is a nitrate analyzer to continually monitor nitrate levels delivered from the El Rio plant. If nitrate levels approach the MCL, an alarm is sent out to the on-call operator.

During very dry periods, such as near the end of a several year drought, nitrate levels in some wells can exceed 100 mg/L or, less commonly, even 200 mg/L. Several wells can have high nitrates at one time. By that time, blending may no longer be adequate to ensure safe drinking water. At that time, a decision would be made to turn on the deep aquifer wells, which are very low in nitrates. With that additional supply, it is expected that nitrates in delivered water can be kept under the MCL.

11.2 MTBE Concerns

Several years ago, MTBE's from spilled gasoline were detected at the Poole Oil site along Vineyard Avenue, about 1,300 feet away from the nearest OH well (Well No. 15). United's groundwater staff have been closely involved in monitoring that MTBE spill and the associated cleanup, which has nearly been completed. Most of the evidence indicates that the spill has been cleaned up and/or has migrated downstream from the wellfield. Each month, MTBE samples are taken from the two OH wells closest to the spill, Wells No. 7 and 15. So far, no MTBE has been detected. However, there is some uncertainty as to what will happen to MTBE levels once groundwater levels rise after the next wet cycle. This problem will be monitored for several more years. In the event MTBE's are detected in any OH wells, use of those wells would be curtailed and, if necessary, the deep aquifer wells would be used.

11.3 Deep Aquifer Wells

The deep aquifer OH wells have not been used for production for over 10 years. They would be pumped only in extreme conditions, as follows:

Very high nitrate levels in the shallow wells
Low groundwater levels in the Oxnard Forebay
Water quality or other emergency with the shallow water wells.
Failure of the shallow wellfield

Although not used for production, the deep wells are usually run once a month to take water samples, and to test the equipment.

Operating the deep aquifer wells introduces additional water quality problems. The high iron and manganese in those wells exceeds secondary MCL's. Despite the sequestering agent added, some effects on the chlorination residual can be expected. The deep wells have not been operated since the chloramination of the OH water was started in 2000.

Maintaining a balance between chlorine and ammonia is tricky at best, and adding varying blends of deep and shallow aquifer water to the mix can introduce chemical imbalances. This problem will require close operator oversight, and will have to be addressed on a trial and error basis once the deep wells come into use for the first time.

Operating the deep aquifer wells could also affect PHWA. It is United's understanding that there could be some scaling problems on the RO and ultrafiltration membranes at the PHWA treatment plant if deep well water is delivered. The OH water is normally fairly low in turbidity, and PHWA just uses bag filters to remove particulate matter. When iron and manganese react with chlorine, a precipitate can occur. The bag filters may not be heavy-duty enough to remove such fine particles. In addition, iron and manganese can cause heavy scaling just by their chemical nature. In the event the deep aquifer wells are used, United must give PHWA advance notice so that they can put anti-scaling measures into place, and weigh the option of receiving Calleguas water during such periods. They would also need to implement monitoring measures, to catch any problems early. The RO membranes are very costly and scaling presents a significant risk.

From time to time, iron and manganese treatment of the OH deep aquifer well water is considered. However, considering how seldom those wells are used, such additional treatment does not appear to be cost-effective or necessary at this time.

11.4 Flushing program

One typical problem with chloraminated water is the risk of nitrification in pipelines and reservoirs. With nitrification, ammonia-eating bacteria grow in the pipeline and cause the disinfection residual to drop, creating water quality problems including unpleasant odors. The OH system is fairly resistant to such nitrification because there are few dead spots where the water does not flow. The major area of concern is near the end of the OH pipeline, past the main PHWA turnout. Flows in that area can be low, causing the potential for nitrification.

To reduce the problem of nitrification, periodic flushes of the OH pipeline are conducted. These flushes can also introduce new water quality problems, particularly for PHWA. Flushes stir up sediment etc. in the pipeline, which can enter the PHWA turnout. High turbidities measured at their plant will shut it down automatically, to protect the equipment. It is necessary to notify PHWA in advance of doing a flush, so that they can shut down for a day or so. Even so, PHWA can have difficulties coming back on line, due to sediment that settles out in their pipeline.

11.5 Line Breaks And Repairs

After an OH line break, it is sometimes necessary to sterilize the pipeline and do a flush. This requires coordination with the OH customers. An emergency flush can create the same water quality problems for PHWA as a planned flush described above. One fortunate aspect of an unplanned flush is that it can delay the need for a subsequent regularly scheduled flush.

11.6 2003 Consumer Confidence Report

As a drinking water system, the OH System is subject to the annual reporting requirements of California and Federal regulations. An annual Consumer Confidence Report (CCR) is prepared for the OH System, and delivered to all OH customers. The larger OH customers (Oxnard and PHWA) use United's information to prepare their own CCR's. However, the smaller mutual water companies, who utilize OH water almost exclusively, use United's CCR as their own, and deliver it directly to their customers. A copy of the 2003 CCR is provided in Appendix B.

12.0 Reliability of the OH Water Supply

The reliability of the OH water supply depends on several factors discussed above: groundwater conditions, weather trends, United's management of surface and ground water, the GMA's demand management efforts, water conservation, and, perhaps most importantly, water quality limitations. The worst drought experienced by the OH System was the 1985-91 seven year drought. By the end of that drought, nitrate levels in some OH wells were high, and groundwater levels had fallen below several well pump intakes. To maintain pumping capacity, several well pumps were reinstalled with deeper bowls. Deep aquifer wells were also used to help meet demand.

The last drought occurred before the improved Freeman diversion was completed. Since then, the ability to recharge groundwater has improved. OH demand is being decreased due to the GMA pumping reductions. Water conservation by agriculture has decreased agricultural demands by as much as 25%. Overall, conditions are much improved since the last drought. It is projected that the OH System will be able to meet its contracted deliveries in the worst expected drought.

13.0 Water Conservation Measures and Programs

13.1 United's Water Conservation Program

United Water has a Water Conservation Program to encourage its customers to conserve water. This program is run by United's *Water Conservation Coordinator*. The objective of the WCP is to identify, promote, and assist in the implementation of water conservation and groundwater protection activities. The WCP includes the following elements and objectives:

School Education:

Develop specific programs targeting grades 3-6
Provide classroom presentations
Provide educational and promotional materials (stickers, pencils, videos, etc.)
Attend school functions and provide materials and a booth
Provide tours of United's facilities

General Public Objectives:

Develop specific programs targeting the general public and the Spanish speaking population
Provide water education/conservation and groundwater protection information through mail
Provide educational and promotional materials
Attend functions, provide material and booth (Science Fair, Farm Fest, etc.)
Provide tours of United's facilities

Urban Use Objectives:

Provide landscape water conservation information for new and existing single-family homes
Provide information on reducing water waste
Provide educational and promotional materials (low flow toilets, xeriscape gardening, leak detection)
Provide information to landscape architects and nurseries
Provide tours of United's facilities

Agricultural Use Objective:

Provide educational seminars on irrigation systems
Provide educational seminars on fertilization
Provide educational and promotional materials on water education/conservation and groundwater protection
Provide tours of United's facilities

Industrial Use Objective:

Provide educational seminars on water conservation and groundwater protection
Provide educational and promotional materials

United's Water Conservation Program makes use of the following resources:

Groundwater Guardian Program: A group of community and affiliate representatives for development of activities for groundwater protection and education.

California Water Awareness Campaign: Provides packets of information for teachers during May – Water Awareness Month.

Water Education Foundation: Provides teaching tools and materials (books, videos, etc.).

ACWA: Provides teaching tools and materials.

DWR and MWD: Provides teaching tools and materials.

UWCD: Funds speakers, educational materials, teaching tools, and trinkets (cups, water bottles, pens, pencils, etc.).

United's water conservation program is well received and appreciated by its constituents.

13.2 Leak Detection Program

On a monthly basis, United tracks potential leakage in the OH system by comparing the amount of water delivered to customers to the amount of water produced from the OH wells. These water losses typically average less than 5%. However, losses (unmetered water) have occurred from time to time due to undetected pipeline leaks, meter failures, improper meter operation, clearwell leaks, construction activities, leaking check valves, and large amounts of flushing. A certain percentage of water loss is built into the OH Agreement, in that the OH wellfield GMA allocation exceeds the amount of water contracted to customers. However, any excessive water losses are costly to the extent that they contribute to any GMA penalties from overpumping. That provides a motivation for keeping water losses to a minimum.

Whenever water losses exceed about 5% in two consecutive months, District staff conduct a thorough review of available data to determine the cause of the water loss. Staff will also visit Oxnard's facilities, to find out whether Oxnard's Venturi meters could be contributing to the loss. Oxnard's old venturi meters at its blending stations have a bypass tube that, if inadvertently left open, can cause the meter to read very low.

In addition, all propeller meters at OH turnouts are rotated at least once every two years. Such meters tend to slow down with age and wear. Replacement meters are in stock for almost all OH meters. When a meter is rotated, a new meter is installed and the old meter is sent to a meter shop for calibration and repairs. The rebuilt meters are then kept until they can be used for the next rotation.

The biggest problem with water losses in the OH pipeline is caused by inaccurate meters used at Oxnard's turnouts. At less than 20% of full flow, Oxnard's old venturi meters read very little of the flow. Low-flow Rosemount meter heads are present, but not hooked up. (Low-flow meterheads are hooked up to the Calleguas supply, but not to the United supply.) These meters are in the process of being replaced with mag meters, as part of Oxnard's blending station upgrades.

14.0 Other Sources of Water

14.1 State Project Water

The Ventura County Flood Control District (now the Watershed Protection District) is a contractor for the State Water Project, SWP, with an annual entitlement to 20,000 acre-feet per year of State water. The County in turn contracted with three local agencies to distribute that SWP water entitlement: 5,000 AF/Yr to Casitas Municipal Water District, 10,000 AF/Yr to the City of Ventura, and 5,000 AF/Yr to United Water Conservation District. United Water is the only agency of the three that has received any of its SWP water. To deliver SWP water to United Water, the California Department of Water Resources releases the water from Pyramid Lake, where it flows down Piru Creek into Lake Piru. The water can then be released downstream as part of the annual water conservation release from Lake Piru. Some of that water will arrive at the Freeman diversion, where it can be recharged into the Oxnard plain aquifers, contributing to the OH water supply.

In 2004, United purchased some of the City of Ventura's annual entitlement to SWP water. Some 2,000 AF of the City's entitlement was delivered into Lake Piru that year. That was the first time Ventura had ever ordered any of their water. (Some of the water recharged aquifers used by Ventura.) There is potential for the purchase of some or all of Ventura and Casitas' SWP water in future years.

The purchase of SWP water is not part of the normal operation of the OH System. United purchases that water for the benefit of the aquifer system, on behalf of all pumpers. In practice, the SWP water is purchased with funds from United's State Water Fund, which is financed through local property taxes. However, such property tax assessments are not collected from areas annexed to Calleguas MWD, primarily Oxnard and PHWA. Those areas purchase SWP water directly from Calleguas MWD, offsetting pumping and benefiting the aquifers as much as does United's purchase of SWP water. Historically, a sharp distinction has always been made between those who are annexed to Calleguas MWD and those who are not. Calleguas and its parent agency, Metropolitan Water District, are the sole suppliers of SWP water within their service areas.

In future emergencies or severe droughts, additional SWP water might become available to supply water to the El Rio spreading grounds. Institutional and contractual arrangements would need to be made, including agreements with Calleguas MWD.

14.2 Supplemental M&I Water Program

The Supplemental M&I Water Program is a new program that will allow OH customers to pump additional water above their reduced OH suballocation. This is a joint program between United Water and Calleguas MWD. Calleguas MWD has partially funded the Conejo Creek diversion, which pumps recycled water from Conejo Creek to Pleasant Valley County Water District, PVCWD, in the eastern part of the Oxnard Plain. PVCWD will then reduce their groundwater pumping. GMA credits accumulated as a result of that reduced pumping will be transferred from PVCWD to Calleguas MWD. Those credits will then be transferred from Calleguas MWD to United Water, and credited to the OH wellfield. That will allow additional pumping from the OH wellfield, which will be delivered to participating OH customers. As part of this program, participating OH customers will pay a surcharge for any supplemental water received.

That surcharge will be transferred to Calleguas MWD as partial compensation for their costs for the Conejo Creek project. As of 2004, two OH customers have expressed interest in this program: Oxnard and Cypress Mutual. More information on this program is provided in Appendix D. As part of this program, United's groundwater management team will exercise discretion on how much supplemental M&I water can safely be used each year without adverse impacts to the aquifers.

15.0 Future Water Supply Projects and Programs

United has several future water supply projects that are being studied and considered, as discussed below:

15.1 Freeman Expansion Project

The Freeman diversion can presently divert more water than can be put to beneficial use. In most years, the District can divert its limit of 375 CFS for up to about four weeks. After that point, the spreading ponds exhibit reduced percolation rates, and the gravel pits are nearly full. Some water that would otherwise be diverted must then flow to the ocean.

The Freeman Expansion Project would deliver surface water diverted at the Freemen diversion into new gravel pits near United's existing facilities. Those new gravel pits would include the Riverpark pits, and the Ferro pit, which have already mined of their aggregate. Use of those pits would increase the yield of the Freeman diversion, increasing the amount of water recharged into the aquifers.

Figure 15-1
Freeman Expansion Project, Phase 1

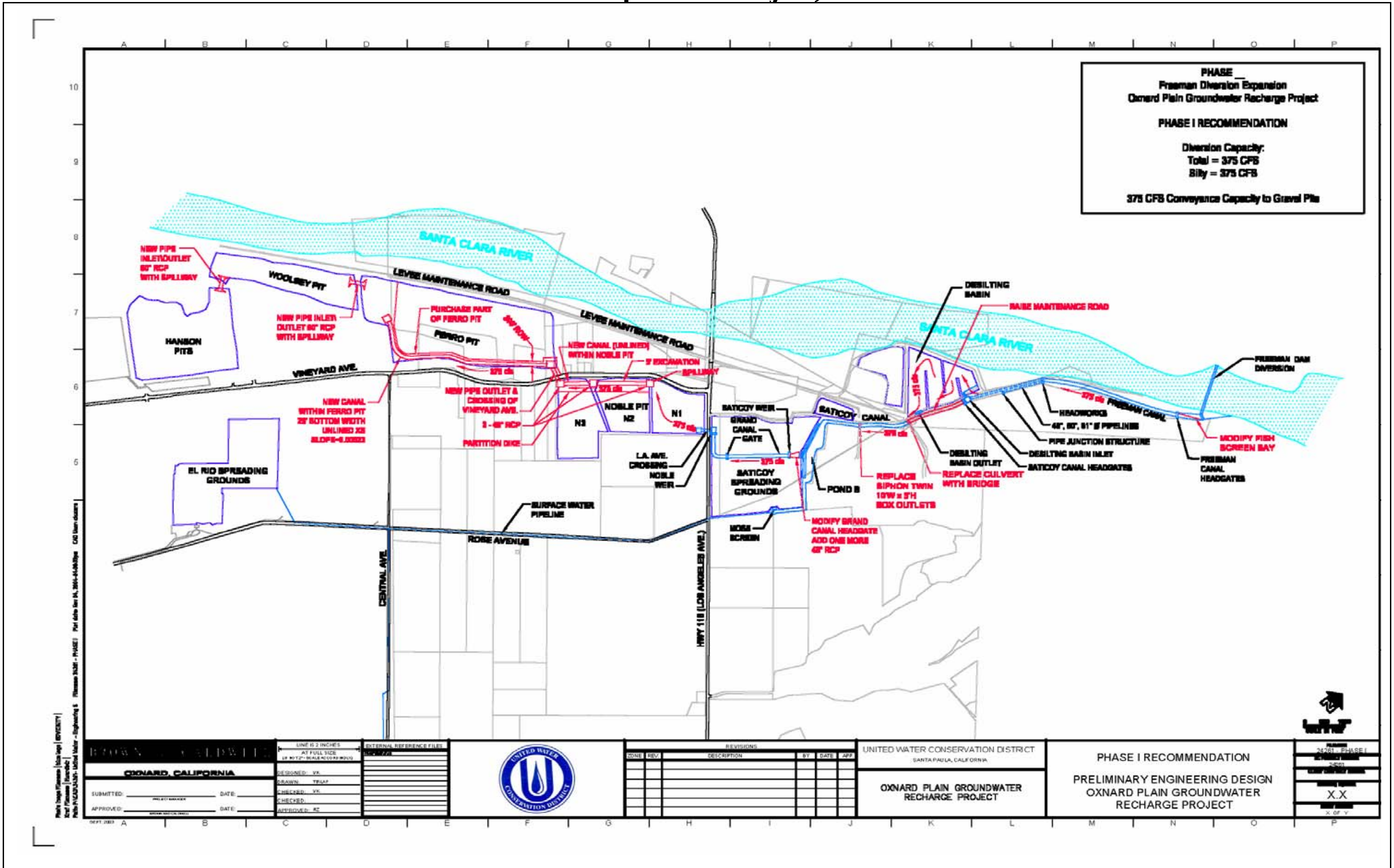
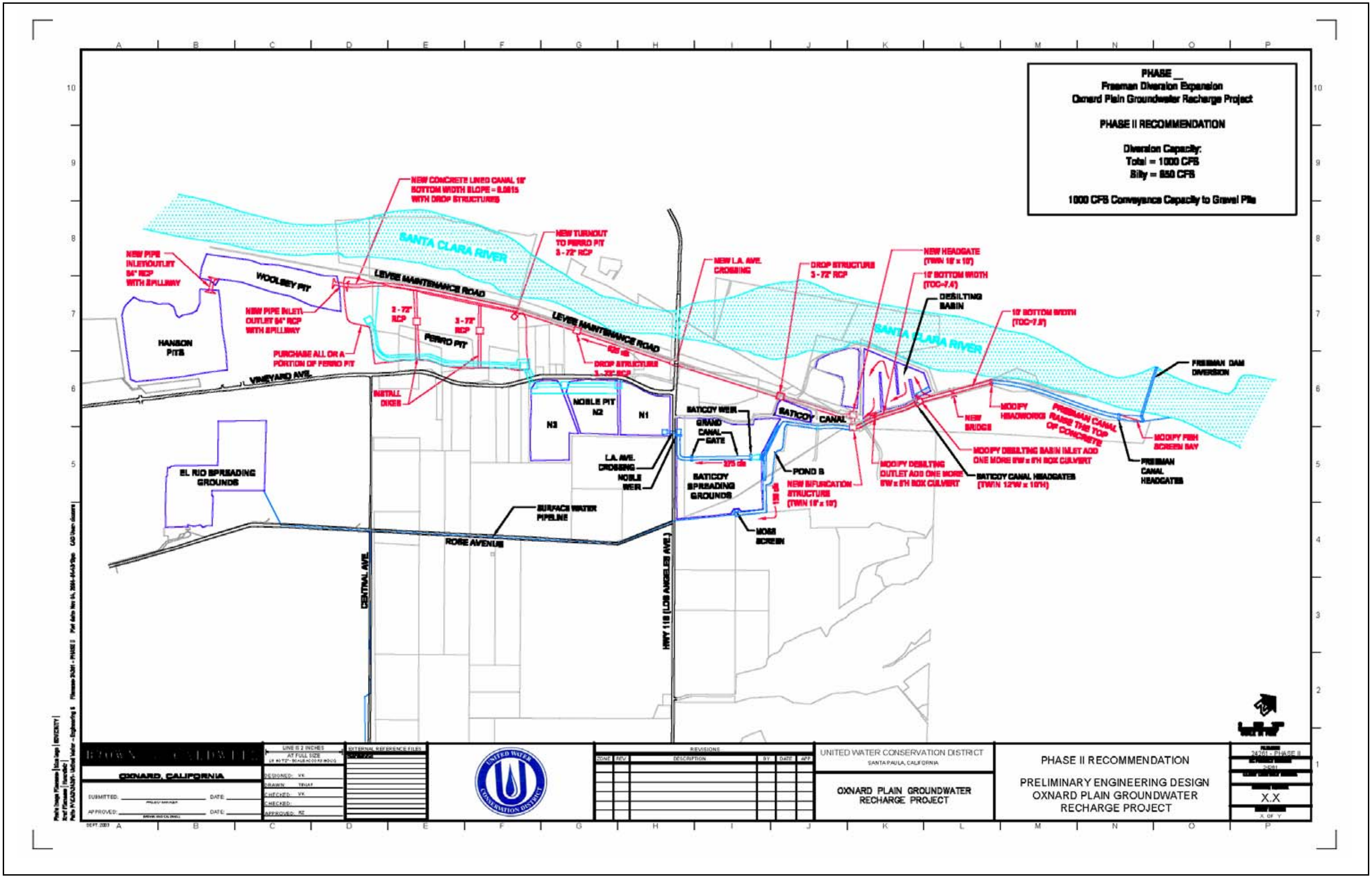


Figure 15-2
Freeman Expansion Project, Phase 2



The Freeman Expansion Project would be constructed in two phases. Phase 1 may start as early as 2007, and would convey up to 375 CFS of diverted water into the new gravel pits. This phase would not require a change to United's water license to divert water. The Phase 1 facilities are shown in Figure 15-1. Phase 2 would increase the diversion rate to 1,000 CFS, which would require a change to United's surface diversion water rights. Receiving a new permit from the State Water Resources Control Board to increase the diversion rate could take 10 years or more. Therefore, Phase 2 would be constructed after the year 2014. The Phase 2 facilities are shown in Figure 15-2.

The Freeman Expansion Project would improve the reliability of the OH water supply. With an increased yield of up to 10,000 AF/Yr on average, this would go a long way toward bringing the Oxnard Plain aquifers into long-term balance.

15.2 Oxnard's GREAT Program

The City of Oxnard is implementing its GREAT program, which will develop additional water supplies for the City. The GREAT program includes several elements, including advanced treatment of wastewater, injection of treated wastewater into the ground, supply of treated wastewater to agricultural users in the Oxnard plain, treatment of OH water to remove salts, and transfers of GMA credits to Oxnard and United to allow increased pumping. The GREAT program will affect the delivery of water through the OH system. Some of the additional water to be received by Oxnard will be delivered through the OH System. In general, RO plants are operated at a steady flow. So, instead of peaking on demand, demands on the OH system should flatten. That would improve the reliability of the OH supply during peak periods.

The GREAT program has undergone, and will continue to undergo, extensive hydrogeological evaluation to ensure that it will not harm the Oxnard Plain aquifers. It is therefore assumed that the GREAT program will benefit the aquifers. Oxnard is the largest OH customer. By improving the overall reliability of Oxnard's water supply, the GREAT program will help ensure the reliability of the water supply for all OH users.

15.3 Sewering El Rio

One of the most important future projects to protect water quality of the OH wellfield will be to install sewers in the El Rio area, located next to, but downgradient of, the OH wellfield. That area consists primarily of residences that are served by individual septic systems. Such septic systems are a source of nitrates, which leach into the groundwater supply. Ventura County is taking the lead role on a project to connect those residences into the City of Oxnard's wastewater collection system. Depending on the amounts of funding that become available, this project could begin construction within the next 10 years.

16.0 Water Shortage Contingency Plans

Several water shortage scenarios are possible for the OH system, as discussed below:

16.1 Historic Three-Year Drought

As previously discussed, there is expected to be an adequate water supply during the worst drought conditions that have historically been experienced in the service area. Under those conditions, it would be feasible to lower the pump bowls to be able to continue deliveries, if necessary. Drought conditions result in dropping groundwater levels. Groundwater in the Oxnard plain is less susceptible to brief droughts, like a three-year drought. Longer droughts, in the range of 7-20 years, are more important for local groundwater supplies.

What is significant is that the OH system survived the last drought without any reductions to OH customers. And that was before the construction of the improved Freeman diversion and other facilities. No institutional restrictions will limit pumping during droughts. It is concluded that the OH system will have adequate water during the worst foreseeable 3-year drought. The quality of the water is a bigger concern than its availability, as discussed below.

16.2 Long-Term Droughts

The highest risk to the OH water supply will occur during long-term droughts, on the order of five years or more. Under those conditions, the groundwater levels in the Oxnard Forebay will drop below the 80,000 AF storage limit, triggering the SWRCB grant conditions. That means that the deep aquifer wells will be used in preference to shallow aquifer wells. That will decrease water quality (secondary standards) of delivered water but will not affect the supply. The delivery of drinking water to OH customers is a higher priority than the grant conditions. Thus, during temporary emergencies, such as mechanical failure of one or more deep aquifer wells, as much water would be pumped from the shallow wellfield as needed to meet OH demands.

16.3 Response to High Nitrate Levels

A significant risk to the reliability of the OH supply is the potential for high nitrates during drought conditions, as described above. In severe droughts, when river water is not available, it is conceivable that many of the shallow OH wells may exceed the MCL for nitrate. Under severe conditions, it may not be possible to blend the available wells to meet the nitrate standard. Nitrate is a primary drinking water standard and must not be exceeded without stringent public notification requirements, and likely the supply of bottled water to some customers. Nitrate levels exceeding the MCL can adversely affect the health of newborn children, which is a scenario to be avoided if at all possible. In the event of a nitrate emergency, United Water, as a wholesale supplier, would work with its customers and the Department of Health to determine an appropriate response by each agency.

Nitrate contamination affects only the shallow aquifer wells. In the event of extensive nitrate contamination of the shallow wells, the deep aquifer wells would be used. Use of the deep aquifer wells would allow some blending with the better shallow wells. With half the shallow wells under the MCL for nitrate of 45 mg/L, full OH deliveries could be made.

United Water is presently conducting studies of nitrate levels to determine their origin and figure out how they reach drinking water wells. Current thinking is that nitrates reside in a thin layer of water at the top of the aquifer. When dry conditions cause that layer to lie within a well's perforations, then high nitrate water is pumped by that well, raising nitrate levels. The present focus of United's nitrate studies is on the collection of data, including several wells with different sampling depths. One goal of the studies will be to assess the risk of nitrate surges in dry periods. However, several years of further study will be needed to obtain final study results.

Based on historical data, it is United's assessment that under all foreseeable groundwater conditions, with the current wells and operation of the OH System, we will be able to blend water to meet our OH customers' demands without exceeding the MCL for nitrates.

16.4 Response to Groundwater Contamination

Another potential risk to the OH water supply could develop as the result of groundwater contamination. This could be created by several sources: spillage of agricultural chemicals, runoff from industrial areas, accidents involving tanker trucks of hazardous chemicals, sewage spills and the like. The District's response to such contamination would be handled on a case-by-case basis. In the case of the recent MTBE contamination in the Forebay, United's Groundwater Department staff became closely involved in oversight of the cleanup program. The two wells closest to the spillage site were tested monthly for MTBE's. Had MTBE's been detected in those wells, they would have been shut off and pumping would have been shifted to wells farther away from the spill; more frequent sampling would also have been undertaken. It is possible that the deep aquifer wells, not as susceptible to surface water contamination, would be pumped to reduce pumping from the remaining shallow wells. Fortunately, the OH System has reserve well capacity to allow shifting of pumping to other wells. However, severe contamination, especially during a high nitrate period, could conceivably result in a reduced pumping capacity that would not meet demands.

The District has prepared a Source Water Assessment of potential sources of contamination of its groundwater supply. That assessment is available for public review at the District's offices.

16.5 Response to Upstream Sewage Spills

The OH wells are located immediately adjacent to recharge ponds in El Rio. The surface water recharged there is subject to contamination by upstream sewage treatment plants. Such contamination could overwhelm the natural filtration and disinfection process, reducing the safety of the OH water for potable uses. Fortunately, it takes several days for water diverted at the Freeman diversion to reach the El Rio spreading grounds. Several times during the last decade, there have been sewage spills into the Santa Clara River. Most of those have been small, and their effects were not measurable at the Freeman diversion. However, one untreated wastewater spill from the Santa Paula wastewater plant caused a high spike in coliform levels at the Freeman diversion.

In almost every case, we have received timely notice from one or more agencies of such spills. The Santa Paula wastewater plant operators, the County Environmental Health Division, the Ventura County Office of Emergency Services, and others are aware of our recharge operation and call us in the event of any spills or emergencies. When we receive such a notification, our normal practice is to stop recharging water at the El Rio spreading grounds. We do that even for minor events, in case the initial assessment of the extent of the spill turns out to be wrong – it is better to err on the safe side. After significant events, we begin monitoring coliform levels at the Freeman diversion and in the desilting basin. Once we have confirmed that levels of coliform have returned to ambient levels, then we can resume recharge operations at El Rio.

The water diverted from the Santa Clara River is raw surface water, and has natural levels of coliform in it. Our desilting basin can effectively restore coliform to ambient levels at low flows. Nevertheless, sewage contamination of river water is a potential problem that is important, and is closely monitored by District staff.

16.6 Upstream Petroleum Spills

There is considerable crude oil production and transportation in the Santa Clara River watershed. From time to time there have been oil spills that reached the river. There have been several such incidents over the last decade, including a major pipeline break after the Northridge earthquake, and an oil truck that crashed into Santa Paula Creek. We have usually received good advance notification of such incidents. We have even received calls from concerned citizens who observed oil in the water before we received any official notifications. Oil spills are easy to see and they receive a good deal of press and public attention.

Our usual practice is to stop diverting water altogether after we receive word of an oil spill. We also take samples of the water in the river, at the diversion. However, we usually do not measure any detectable levels of hydrocarbons, even when we see oil floating on the surface, due to the large amount of dilution that take place. Unlike sewage spills, which are harder to detect, we can easily see oil floating on the river water after an oil spill. Once we have determined the real extent of the spill, and after the oil sheen has returned to ambient levels, we resume water diversions. The desilting basin also provides some detention time to help any crude oil decompose, or be digested by microorganisms.

As a point of reference, there are natural oil seeps in the watershed, and even under the best of circumstances one can observe occasional swirls of oil on the surface of the river water. These natural seeps can be observed along Highway 150 near St. Thomas Aquinas College, and in Sespe Creek near the confluence with Tar Creek. In Sespe Creek, one can even observe trout living in deep pools of clear water that has an oil sheen on top. After one storm that caused flash floods near sulfur mountain, we found gobs of tar in our fish ladder. The presence of crude oil in the watershed is a natural phenomenon.

16.7 Short-Term Power Outages

The OH System is well protected against short-term power outages, lasting under 12 hours. When power is lost to the OH wellfield, the wells stop pumping into the clearwells. Fortunately, the two 8.4 MG reservoirs (clearwells) provide nearly one day's storage under average demand conditions. Thus the wellfield can be out of service for a while before the system runs out of water.

When power is lost to the OH electric booster pumps, the natural gas-driven booster pumps start automatically, and take over the pumping within a minute or so. The pressure in delivered water drops for a few seconds, and then recovers to a slightly lower level. For control reasons, the gas-driven pumps maintain a pressure of 40 psi at the OH plant, lower than the normal 60 psi maintained by the electric booster pumps. When power comes back on, the electric pumps resume pumping, and the normal 60 psi is resumed. When that happens, the control system slows down the natural-gas engines, and they idle until the operator arrives to shut them down manually.

To maintain power to our facilities during brief power outages there are several standby diesel generators at the OH plant:

1) A standby generator next to the gas-driven booster plant, which drives the SCADA system and much of the plant (but not the booster pumps).

2) A standby generator within the chlorine building which operates the disinfection facilities during power outages.

3) A standby generator near the shop building that operates the metering and post-chlorination detectors during power outages.

4) The SCADA system floats off of batteries, which power inverters. When power is lost, the SCADA system continues to function off the batteries with all of its control and data capabilities intact. During the outage, the battery charger continues to be powered by the standby generator.

All of these components have been tested many times during brief power outages. We are able to routinely deliver water to OH customers during power outages.

16.8 Natural Gas Outages

The standby gas-driven booster pumps depend on the supply of natural gas. If an emergency were to occur that resulted in the loss of natural gas alone, the OH supply would not be affected, because pumping would continue via electric power.

If an emergency caused loss of both natural gas and electric power, the OH booster pumps would not work. It would not be possible to deliver water to OH customers at a pressure of 60 psi. Fortunately, it is possible to deliver water to our customers by gravity from the clearwells. That was how the system was operated before 1967 – water flowed by gravity into the OH pipeline to the customers, who are at a lower elevation than the plant. The booster plant was built in 1967 because Oxnard wanted to be able to blend OH water with higher pressure water from Calleguas MWD without repumping. During the construction of the 1997 El Rio Improvements, a 24-inch bypass pipe and valve was constructed between the clearwell manifold and the booster pump discharge pipes. When pressure in the OH line drops below a certain point, a "fail-open" valve automatically opens to allow water to flow from the clearwells into the OH pipeline. The maximum amount of water that can flow by gravity is limited to around 25 CFS. But that will meet the most important water needs of the OH customers. Under low pressure conditions, less water will be used by the customers. (Less water comes out of a tap at low pressure.)

Under gravity flow conditions, the two schools in El Rio will not receive water at adequate pressure for domestic purposes. Without an alternate supply of water, the schools would need to be closed for the day. The supply to Vineyard Avenue Estates would also be at low pressure, but they have the ability to repump from their tank to attain adequate pressure. Both of these customers were added to the OH System in the 1990s, and neither had been previously served by gravity flow.

Natural gas outages are rare. Unlike electric outages, we have never experienced a loss of natural gas. Even after the 1994 Northridge earthquake, when electric power was out for 10 hours, water lines broke, and phone lines were down; there was plenty of natural gas.

16.9 Long-term Power Outage

A long-term power outage could be caused by a severe earthquake, sabotage, or major equipment failure in the power grid. An example is the major east coast power failure of 2003, precipitated by cascading failures in the interconnected power supply. With California power lines passing over many earthquake faults, and a single western power grid between Canada and Mexico, such a power failure is not out of the question in our area. After the 1994 Northridge earthquake, local power was out for about 10 hours. Deregulation of the power industry has also reduced the numbers of crews available to make emergency repairs, which could delay resumption of power after any large scale emergency.

The OH System has a 750 KW diesel-powered generator for the OH wellfield. The generator is supplied by an 8,000 gallon diesel tank, which has enough fuel to last three days, more with rationing. The generator is able to supply temporary power only to the OH shallow water wells. It has enough power to run 6 or 7 of the OH wells at one time. This would allow a continued water supply to OH customers at a somewhat reduced flow.

The 750 KW gen-set does not come on automatically after major outages. Instead, operations staff must start the generator manually. As discussed above, OH water will continue to be delivered automatically after any power outage. However, the clearwells will eventually run out of water after 12 to 24 hours. A decision to start the generator would be made if there are indications that the power will be off for some time. Such indications could come from SCE, press reports, a lack of good reports, or a sense that an emergency is severe enough that power is unlikely to be restored soon.

The 750 KW generator will deliver water into the clearwells, to keep them full. If natural gas is available (or power is available at the electric booster pumps), then water would be pumped from the clearwells into the OH pipeline at pressure. If natural gas is not available, then the water would flow by gravity from the clearwells into the OH line. Under the worst case scenario, United could deliver water at a lower-than-normal pressure to our OH customers as follows: wells powered by the 750 KW generator would pump water into the clearwell, which feeds the OH line by gravity, while disinfection is powered by another standby generator.

Therefore, under the worst-case power-loss scenario, United should be able to continue water deliveries to OH customers.

16.10 Major Equipment Failure

The OH water supply could be interrupted for any one of the following reasons:

1) Microbial contamination Should positive coliforms be detected in violation of the Coliform Rule, we may have to issue a boil order notice to the public and/or the retail customers, depending on the nature of the event and on recommendation by the Department of Health Services.

2) Major Pipeline Failure The OH pipeline is a single line, with no loops. If it fails catastrophically, the OH supply would be interrupted to any customers downstream of any isolation valve, until repairs could be made. There are not many isolation valves in the pipeline, so a break in a critical spot could interrupt the supply to all customers.

3) Failure of the Clearwells If both clearwells were to fail, it would not be possible to deliver disinfected water from the shallow wells, since contact time is provided by the clearwells. However, it may be possible to continue delivering water to those OH customers who have no other source of supply. Oxnard, PHWA and the Ocean View pipeline would be shut off from the OH supply. Wells 11, 12, and 13, which are not under the influence of surface water, would be operated through the small settling basin. The post chlorination location would become the sole chlorine injection point. Ammonia injection would be discontinued, because of the difficulty of maintaining the right mixture. Then water could be delivered to the smaller OH customers. The settling basin does not have an overflow. So the trick will be to keep the water in the settling basin at the right level, without overtopping the basin. The booster pumps would be shut off, and water would be delivered by gravity.

4) Disinfection Building Failure In the event of a fire or major damage to our disinfection building, we would not be able to disinfect the OH supply. We would immediately stop pumping from the OH wells, to preserve any disinfected water already in the clearwells. We would then shut off all customers who have other sources of water, including the Ocean View pipeline. We would then remove the skid-mounted hypochlorite disinfection unit from the PTP system. (The farmers can do without chlorination of their irrigation supply for a while.) The skid unit would be installed at the El Rio plant and rigged to pump into the OH system, with large amounts of flushing water. We could then chlorinate a limited amount of water for use by those OH customers who do not have other sources of supply. Contact time can be obtained in the pipeline at low flows. Once this temporary system is working, we could then open the Ocean View pipeline, after we have notified the OVMWD customers that water use there must be limited to domestic purposes. This temporary setup could be operated indefinitely, until repairs could be made to the disinfection facility. However, the disinfected water would be chlorinated, but <u>not</u> chloraminated.

5) SCADA System Failure If the SCADA system, including some major instrumentation components, fails completely for some reason, it could disrupt our ability to deliver water. Once an assessment of the problem is made, adjustments could be made to our operation to continue serving water. For example, wells could be turned on and off manually, chlorine dosage rates could be set manually, and the booster pump VFD's can be set to deliver water at a range of pressures. Staff would be placed on 24-hour shifts to continually operate the system. We could draw operators from other locations (Saticoy) to help keep the system running at all hours. We expect to be able to deliver water in the event of a control system failure.

16.11 Fifty Percent Reduction In Supply

Our two largest OH customers have other sources of water. Oxnard receives water from Calleguas MWD and City wells, and PHWA receives water from Calleguas. In the event of a fifty percent reduction in supply, United would ask those two customers to take additional water from Calleguas. Oxnard could also pump their own wells. In a real, long-term emergency it may be possible, with approval of the GMA, to transfer some OH credits to Oxnard so that they could pump their own wells. Calleguas MWD also has GMA credits, and a transfer of those credits could be considered in any unexpected County-wide emergency.

The other OH customers, including the four mutual water companies and the schools, do not have other reliable sources of water. In a water shortage emergency, preference would be given to providing OH water to such customers.

16.12 Interruption of Water Supplies

The OH water supply could be interrupted for any of the following reasons:

1) Major equipment failure
2) Severe earthquake
3) Sabotage
4) Acts of war

In the event of such an interruption, we may shut off the OH water supply to Oxnard, PHWA, and Ocean View MWD. We would notify our remaining customers to conserve water as much as possible. We would then try to make the water remaining in the clearwell last as long as possible.

In such an emergency, United would likely retain the ability to pump water out of its wells, using its 750 KW generator. We would be able to fill water trucks, water buffaloes, and the like at the plant. We would allow the public and other agencies to refill water containers there. Temporary connections would be made to hydrants etc. to allow that to happen. Access to our water would be provided along Rose Avenue, where there is easy access. We prepared for a similar scenario as part of our "Y2K" readiness program.

17.0 Mandatory water use prohibitions

In the event of a water shortage, United's board would pass a resolution declaring a water shortage emergency. Mandatory water use prohibitions would be placed in effect. The following uses of OH water could be prohibited:

Outside irrigation
Washing cars
Agricultural irrigation

Another option that would be considered would be to implement scheduling for irrigation uses.

18.0 Vulnerability Assessment

In 2003, United Water received an EPA grant to prepare a Vulnerability Assessment of its water supply. A consultant was hired to prepare the VA. The VA focused on various types of threats including terrorist attacks and sabotage. Various weaknesses were investigated and steps were designed to reduce the risk of damage to the OH water supply and injuries to customers. Many of the recommendations in the VA were put into effect. In accordance with the VA, United staff are trained in how to respond to potential attacks. Because of the sensitive nature of the VA, it is not made available to the general public.

19.0 Reclaimed Water Supply

Several sources of reclaimed wastewater are available in United's service area. Some of that reclaimed water is already being put to beneficial use, either directly or indirectly. These sources are summarized below:

1) Los Angeles County There are two wastewater treatment plants in Los Angeles County that discharge tertiary treated wastewater into the Santa Clara River, upstream from United's service area. A total of over 30 CFS is discharged at present. Due to growth in Los Angeles County, that flow is increasing over time. During most of the year, this reclaimed water flows down the Santa Clara River and percolates into the Piru groundwater basin, where it blends with local groundwater and is repumped, or it migrates underground toward the Fillmore basin. In wetter periods, when the Santa Clara River is flowing well, the wastewater blends with surface water and contributes to the surface water supply. Some of that water is diverted at the Freeman diversion. Fortunately, in such wet periods, a great deal of blending with natural storm water occurs. Only in very wet periods, when flows at

the Freeman diversion exceed 375 CFS, does that reclaimed water flow to the ocean. That happens about four weeks a year on average. Thus, little of the reclaimed water produced in Los Angeles County goes to waste, and is used indirectly, after mixing with other water sources and being filtered underground.

2) Fillmore and Piru Wastewater Treatment Plants The Fillmore wastewater treatment plant and the Piru wastewater treatment plant both discharge treated wastewater into percolation ponds. That water recharges the Fillmore and Piru groundwater basins, and is beneficially used via well pumping, after mixing with local groundwater supplies and being filtered underground.

3) Santa Paula Wastewater Treatment Plant The Santa Paula wastewater treatment plant is located about two miles upstream of the Freeman diversion. It discharges about 2 MGD of secondary effluent into the Santa Clara River. Most of the water discharged from the plant blends with other water and is diverted at the Freeman diversion, and used for groundwater recharge. River water is also distributed to growers for agricultural irrigation. During low flow periods, when a greater percentage of the surface water is wastewater, most of that water is delivered to farmers. The Santa Paula wastewater plant has occasionally suffered spills that have halted United's diversions. The City of Santa Paula is currently designing an upgrade to the plant. The City may eventually use some of their reclaimed water for irrigation purposes. When that happens, the wastewater will continue to contribute to the local water supply.

4) Saticoy Sanitary District Saticoy Sanitary District operates a wastewater plant about two miles downstream of the Freeman diversion. They percolate about 130 AF/Yr of wastewater into percolation ponds north of the Santa Clara River. That water recharges the Oxnard Forebay, and indirectly contributes to the water supply for the OH system. Although that reclaimed water is unlikely to migrate towards the OH wellfield, it supplies other pumpers that draw from the Forebay.

5) City of Oxnard The City of Oxnard operates a wastewater plant that discharges some 20,000 AF/Yr of secondary effluent into the ocean. That represents a significant water resource that could benefit the Oxnard plain. The City of Oxnard has investigated the beneficial use of that wastewater through further treatment, which would allow it to be used for agricultural irrigation and even direct groundwater recharge. Use of the City's reclaimed water is part of the City's GREAT program, described above, which is in the early stages of implementation. United will participate in several stages of that program, in partnership with Oxnard. Thus, reclaimed water will become an important part of the water supply picture on the Oxnard plain.

6) The City of Ventura The City of Ventura operates a wastewater plant that discharges into the Santa Clara River estuary, from where it flows into the ocean. The city is required by permit to discharge at least 5.6 MGD into the estuary, to maintain habitat there. Wastewater flows above 5.6 MGD are pumped and used for irrigation purposes at the River Ridge Golf Course, the Olivas Park Golf Course, and other locations. In peak demand summer months, there is little unused reclaimed water from this plant. Therefore, there is only a limited potential to increase reclaimed water use from this source.

7) Conejo Creek Project At the Conejo Creek diversion on Conejo Creek just south of the Ventura Freeway, water from the creek is pumped to irrigation customers, including Pleasant Valley County Water District on the eastern Oxnard plain. PVCWD pumps its own groundwater from the Oxnard plain aquifers and also receives river water from United Water. Thus, any Conejo Creek water received by PVCWD reduces their use of surface and groundwater. This increases the amount of water available to others. Part of the water in Conejo Creek comes from the Hill Canyon Wastewater Treatment Plant, operated by the City of Thousand Oaks. Thus, the Conejo Creek project is partly a reclaimed water project.

20.0 Adoption of the Urban Water Management Plan

A hearing for the Urban Water Management Plan was held on January 12, 2005, at United's regular board meeting in Santa Paula. The hearing consisted of a brief presentation on the plan, and response to questions from the public and other agencies.

After the hearing, copies of the draft UWMP were sent to the following agencies for review and comment:

City of Oxnard
Port Hueneme Water Agency
Calleguas MWD
City of Ventura
Fox Canyon GMA/County of Ventura
Vineyard Avenue Estates
Dempsey Road Mutual Water Company
Cypress Mutual Water Company
Saviers Road Mutual Water Company

Ocean View MWD
El Rio School District
Pleasant Valley County Water District
Frank B and Associates

The final 2005 UWMP was adopted by the Board of directors on February 9, 2005.

Appendix A

GMA Groundwater Management Plan

Appendix B

2003 Consumer Confidence Report

Appendix C

SWRCB Grant Conditions for Operating the Forebay

Appendix D

Supplemental M&I Water Program

FOX CANYON GROUNDWATER
MANAGEMENT AGENCY PLANNING STUDY

TASK 86-3

GROUNDWATER MANAGEMENT PLAN FOR THE FOX CANYON GROUNDWATER MANAGEMENT AGENCY

VENTURA COUNTY PUBLIC WORKS AGENCY
FLOOD CONTROL AND WATER RESOURCES DEPARTMENT
SEPTEMBER 1985

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ABBREVIATIONS

208 Study - 208 Areawide Waste Treatment Management Planning Study

AB 2995 - Assembly Bill 2995 (Created the Fox Canyon Groundwater Management Agency)

AF/yr - Acre-Feet per year; one acre-foot equals 325,851 gallons.

cfs - Cubic Feet per Second

County - Ventura County

GMA - Fox Canyon Ground Water Management Agency

LAS - Lower Aquifer System

M&I - Municipal and Industrial

O-H Pipeline - Oxnard-Hueneme Pipeline

PTP - Pumping Trough Pipeline (Phase I of Oxnard Plain Seawater Intrusion Control Project)

Pleasant Valley - Pleasant Valley County Water District

SAP - State Assistance Grant Program

SWRCB - State Water Resources Control Board

UAS - Upper Aquifer System

UWCD - United Water Conservation District

VCFCD - Ventura County Flood Control District

GROUNDWATER MANAGEMENT PLAN FOR
THE FOX CANYON GROUNDWATER MANAGEMENT AGENCY

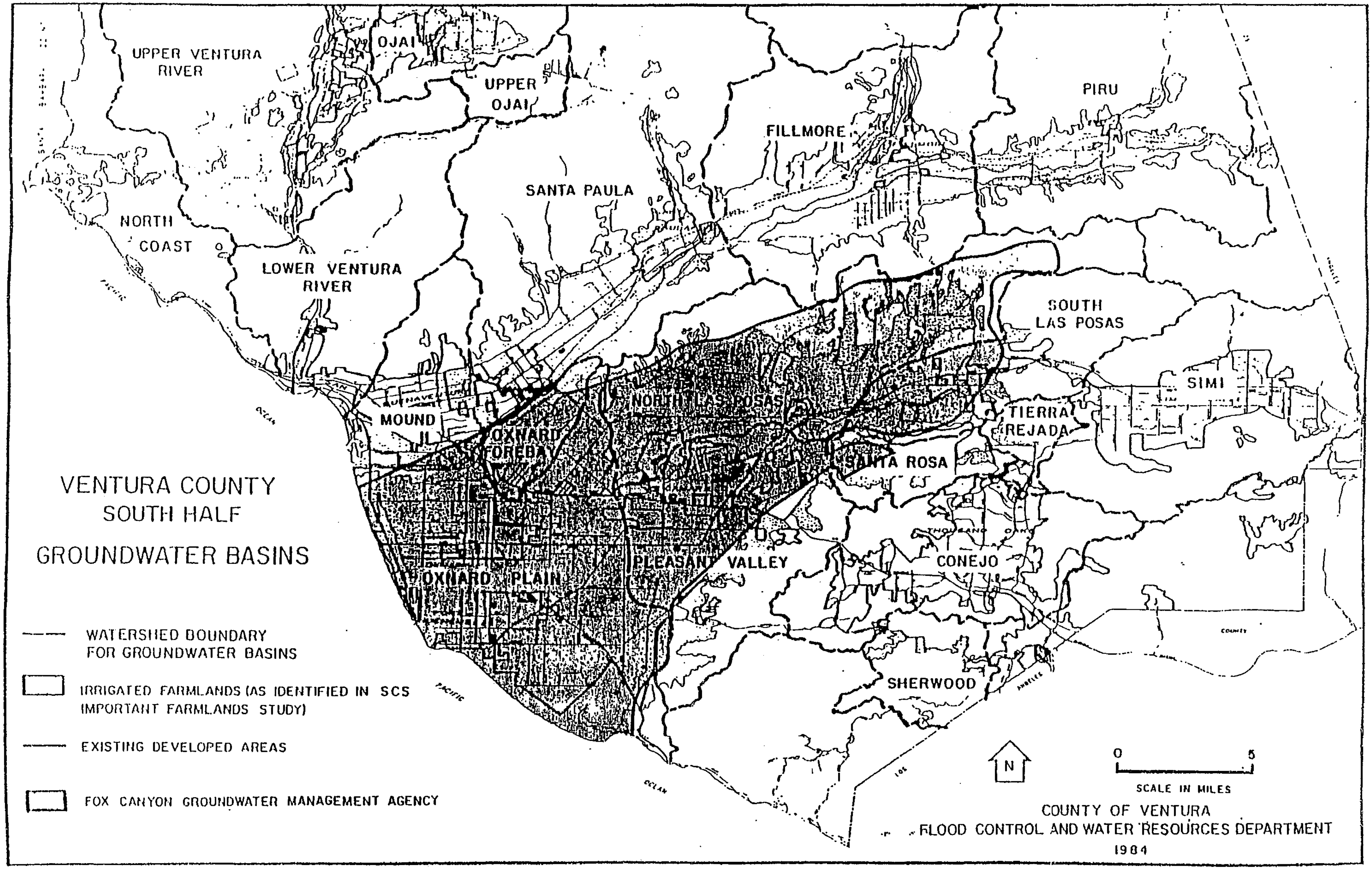
INTRODUCTION

The GMA was created to preserve groundwater resources for water users in all areas overlying the Fox Canyon aquifer zone. The boundary of the GMA shown in Figure 1 includes numerous extensive groundwater basins which collectively contain more than 18 million AF of fresh water in storage and supply about 70 percent of the area's water demand.

Long-term overdraft beneath the Oxnard Plain has caused extensive on-land seawater intrusion in the Oxnard aquifer zone. Seawater intrusion constitutes a serious threat to this and other underlying aquifer zones which serve as the largest source of water supply to the area. By the summer of 1984, seawater had intruded an onland area of about 22.7 square miles in the Oxnard aquifer zone, which is an increase of 1.8 square miles over the previous year. Because this is one of the most serious water resources problems in California, the partially State funded Oxnard Plain Seawater Intrusion Control Project is now being constructed by UWCD and the County.

Section 601 of AB 2995, which created the GMA, states that: "The Agency shall develop, adopt, and implement a plan to control extractions from the Oxnard and Mugu aquifers with the objective of balancing water supply and demand in the Oxnard Plain of Ventura County by the year 2000." The Oxnard aquifer zone and Mugu aquifer comprise the UAS. The UAS management plan was

FIGURE I



UPPER VENTURA RIVER
OJAI
UPPER OJAI
SANTA PAULA
FILLMORE
PIRU
NORTH COAST
LOWER VENTURA RIVER
SOUTH LAS POSAS
SIMI
MOUND
OXNARD FOREBAY
NORTH LAS POSAS
TIERRA REJADA
SANTA ROSA
PLEASANT VALLEY
CONEJO
OXNARD PLAIN
SHERWOOD
PACIFIC
OCEAN
VENTURA COUNTY
SOUTH HALF
GROUNDWATER BASINS
WATERSHED BOUNDARY FOR GROUNDWATER BASINS
IRRIGATED FARMLANDS (AS IDENTIFIED IN SCS IMPORTANT FARMLANDS STUDY)
EXISTING DEVELOPED AREAS
FOX CANYON GROUNDWATER MANAGEMENT AGENCY
N
0
5
SCALE IN MILES
COUNTY OF VENTURA
FLOOD CONTROL AND WATER RESOURCES DEPARTMENT
1984

derived from previously completed 208 studies and GMA studies conducted by Ventura County.

Section 602 of AB 2995 requires that a LAS management plan be developed and adopted. The legislation indicates that the LAS management plan shall include determination of the hydrologic characteristics in the GMA and include a plan for future extractions to the year 2010. The following items are included in the GMA plan because they are specifically required by the legislation and/or because they are considered necessary elements of the plan.

SUMMARY GMA MANAGEMENT PLAN

The following items constitute the GMA Management Plan. They are presented in order as they occur in the body of this report.

1. Future groundwater extractions in each GMA basin will be limited to the amounts shown in Tables 1 and 2.

2. The GMA encourages both wastewater reclamation and water conservation as provided for in Sections 503 and 701 of the GMA legislation. When benefits of proposed wastewater reclamation - water conservation programs are combined (Table 6), the total projected GMA overdraft is reduced from 41,300 to about 5,600 AF/yr in the year 2010. If 75% grant funding is available, the wastewater reclamation projects recommended in the County 201 study should be implemented in the North Las Posas and Oxnard Plain Basins during the planning period.

3. The Oxnard Plain Seawater Intrusion Control Project consisting of the pumping trough pipeline, LAS wells and Vern

Freeman Diversion is adopted as a part of the UAS Management Plan. Project components and water allocation are shown in Figure 6.

4. Operating Criteria for the Oxnard Plain required by the SWRCB for the Seawater Intrusion Control Project are adopted as a necessary UAS Management Plan element. The operating criteria are required to ensure proper water allocation.

5. Ventura County Ordinance No. 3739 is included as part of the UAS Management Plan because it prohibits the construction, repair or modification of UAS water wells in areas where they would cause overdraft or seawater intrusion in the Oxnard Plain Pressure Basin.

6. The Annual Groundwater Monitoring Program required by the SWRCB is included in the plan to monitor effectiveness of the Oxnard Plain Seawater Intrusion Control Project.

7. LAS Water Quality Monitoring at coastal locations shown in Figure 9 will detect LAS seawater intrusion and trigger implementation of the Contingency Plan.

8. The five stage LAS Contingency Plan (Table 7) is included to deal with onland seawater intrusion into the LAS.

9. North Las Posas Pumping Restrictions will limit extractions in this Basin to the GMA projections shown in Tables 1 and 2. These restrictions prohibit expansion of all types of water use to land on or topographically above the LAS outcrop (Figure 10) while allowing expansion of irrigated agriculture in a 7.87 square mile area south of the LAS outcrop. The GMA will develop and adopt an ordinance to regulate drilling of new LAS water wells in the North Las Posas Basin.

10. GMA water well extractions will be carefully monitored semi-annually to ensure that they do not exceed adopted projections for that basin. If monitoring indicates that GMA projections are being exceeded when adjusted to an average annual water use basis in any GMA basin, a pumping restriction or "water duty" will be established for each parcel of land in that basin.

11. Implementation of Drilling and Pumping Restrictions will be accomplished by modifying the existing County water well ordinance. Administration of the modified ordinance can be performed by VCFCD.

12. Groundwater extractions will be accurately metered and reported in the semi-annual statement in areas of the GMA where pumping restrictions are imposed throughout the basin or to implement the LAS Contingency Plan.

PROJECTED GROUNDWATER EXTRACTIONS 1980 TO 2010 (UAS & LAS)

For this study all present and future groundwater extraction data developed was divided into agricultural and M&I categories by groundwater basin (See Figure 1). The influence of the Seawater Intrusion Control Project on future groundwater demands was included.

TOTAL WATER USE

To determine the year 2010 irrigated agricultural land area, the urban expansion acreage was subtracted from 1981 irrigated acreage. Projections of agricultrual demand for ground water are shown in Table 1. M&I extractions were determined using 1979 population data. The resulting M&I demands remained

TABLE 1

PROJECTED IRRIGATION GROUNDWATER DEMAND IN GROUNDWATER MANAGEMENT AGENCY

Basin	Water Demand in AF/Yr						
	1980	1985	1990	1995	2000	2005	2010
Oxnard Forebay	5,500	5,200	5,000	4,800	4,600	4,500	4,400
Oxnard Pressure	59,400	57,000	47,700	45,400	43,200	40,800	38,700
Pleasant Valley	15,300	13,700	17,900	16,200	14,500	12,800	11,200
North Las Posas	34,000	35,400	36,600	38,000	39,500	40,900	42,300
South Las Posas	6,600	6,000	5,400	4,800	4,500	3,700	3,300
Santa Rosa	600	600	600	600	600	600	600
IRRIGATION TOTAL	121,400	117,900	113,200	109,800	106,900	103,300	100,500

TABLE 2

PROJECTED MUNICIPAL AND INDUSTRIAL GROUNDWATER DEMAND IN GROUNDWATER MANAGEMENT AGENCY

Basin	Water Demand in AF/Yr						
	1980	1985	1990	1995	2000	2005	2010
Oxnard Forebay & Oxnard Pressure	26,000	29,400	36,200	39,700	43,100	46,400	49,900
Pleasant Valley	2,900	3,500	4,100	4,700	5,200	5,800	6,400
North Las Posas	400	600	800	900	1,100	1,300	1,500
South Las Posas	700	1,200	1,600	2,000	2,500	2,900	3,300
Santa Rosa*	---	---	---	---	---	---	---
MUNICIPAL & INDUSTRIAL TOTAL	30,000	34,700	42,700	47,300	51,900	56,400	61,100
TOTAL GROUNDWATER	151,400	152,600	155,900	157,100	158,800	159,700	161,600

* All agricultural land use.

unchanged for the Pleasant Valley Basin; however, adjustments were necessary in the other basins. Results of the 1979 and 2000 M&I determinations are presented in Table 2.

As shown in Table 2, groundwater demand within the GMA will increase from 151,400 AF/yr in 1980 to 161,600 AF/yr by year 2010. During this period agricultural water demand in the GMA will decrease by 17%, from 121,400 AF in 1980 to 100,500 AF by the year 2010. Agricultural water demand will be reduced or unchanged in every area except the North Las Posas Basin where expansion of agricultural land should increase extractions by about 25% by the year 2010. The M&I demand for groundwater will more than double, from 30,000 AF/yr in 1980 to 61,100 AF/yr by year 2010. Overall demand for groundwater in the GMA will increase only slightly in the next thirty years. However, there will be significant shift from agricultural to M&I use as urban expansion displaces farmland.

ADOPTION OF GMA PROJECTIONS

The projected extractions shown in Tables 1 and 2 are adopted as part of the management plan and future groundwater extractions in each basin will be limited to these amounts. In the North Las Posas Basin these GMA projections were based on the assumption that irrigated agriculture would occupy all presently unused land south of the LAS outcrop (surface exposure). This assumption will limit the North Las Posas Basin expansion of irrigated agriculture to 7.87 square miles (5,037 acres) by the year 2010.

AVERAGE STORAGE AND CHANGE IN GROUNDWATER STORAGE 1980 TO 2010 (UAS & LAS)

Change in storage (overdraft or surplus) by basin or area was determined from 1980 to year 2010. Results, shown numerically in Table 3 and graphically in Figure 2, indicate that groundwater storage decreases substantially throughout the study period in the Oxnard Plain, Pleasant Valley, North Las Posas Basins and North Offshore Sub-Basin while storage increases slightly in the South Las Posas and Santa Rosa Basins. The largest overdraft increase is projected to occur in the North Las Posas Basin where overdraft will increase from 8,400 AF/yr in 1980 to 17,800 AF/yr by year 2010.

Results of 1980 groundwater storage calculations show that the total quantity of onshore freshwater in the GMA was more than 14 million AF. The offshore LAS fresh groundwater storage value of approximately 4.9 million AF in the North Offshore Sub-Basin raises the 1980 GMA groundwater storage total to about 19 million AF.

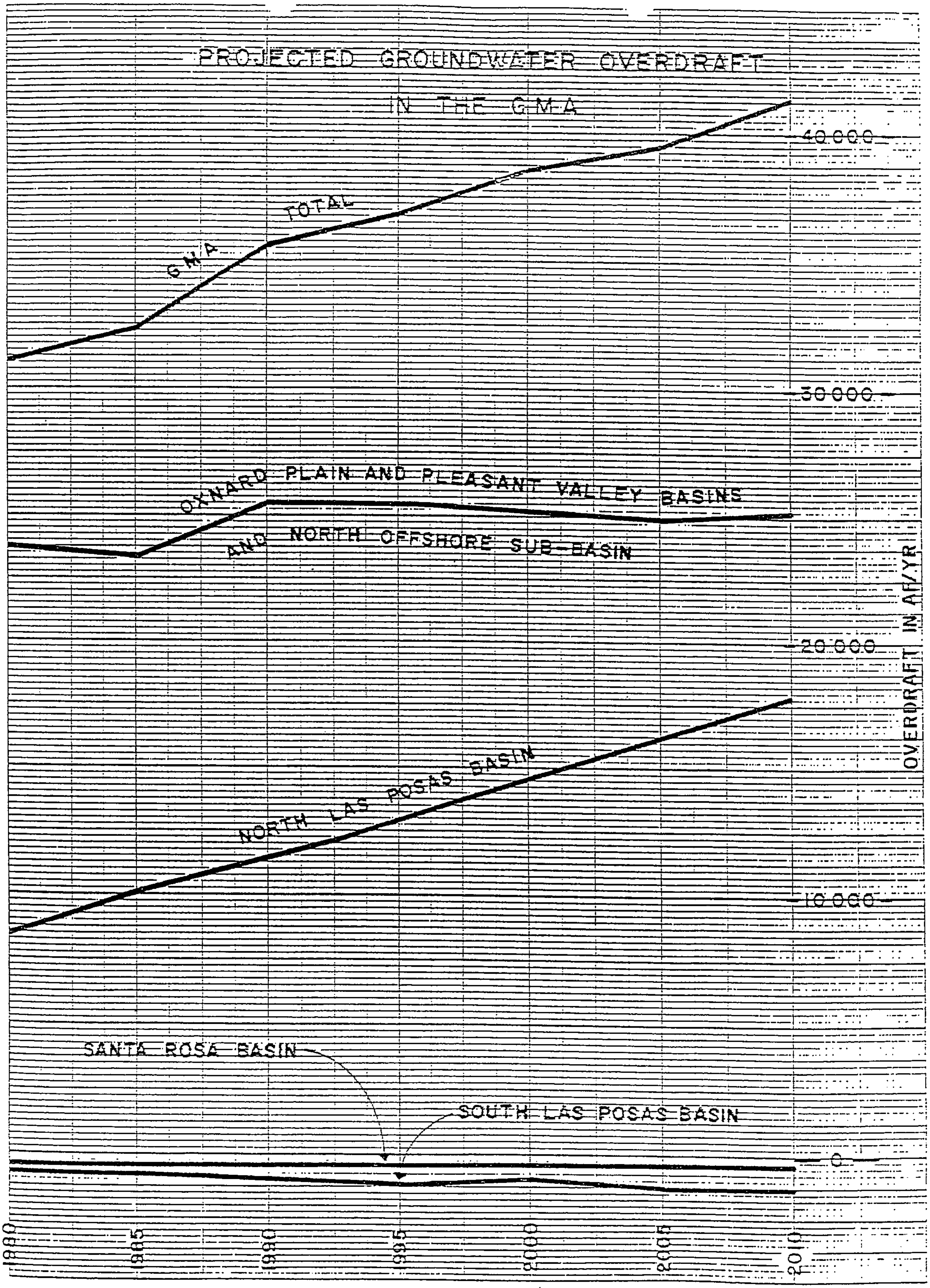
Groundwater storage estimates were projected to year 2010 in five-year increments. Results show that GMA groundwater storage will decrease by about 1.1 million AF by year 2010. The largest decreases in groundwater storage will occur in the Oxnard Plain and Pleasant Valley Basins and the North Offshore Sub-Basin where groundwater storage will decrease by about 750,000 AF.

By year 2010, total GMA groundwater storage is projected to decrease from greater than 19 to slightly less than 18 million AF. It should be emphasized that this value represents gross storage, not recoverable storage.

GMA WATER BALANCE
OVERDRAFT OR SURPLUS = INFLOW - WATER DEMAND
IN AF/YR

BASIN/YEAR	1980	1985	1990	1995	2000	2005	2010
Oxnard Plain, Pleasant Valley and North Offshore Sub-Basin							
Groundwater Demand	-109,100	-108,800	-110,900	-110,800	-110,600	-110,300	-110,600
Inflow	+ 85,400	+ 85,400	+ 85,400	+ 85,400	+ 85,400	+ 85,400	+ 85,400
Change in Storage (Overdraft)	- 23,700	- 23,400	- 25,500	- 25,400	- 25,200	- 24,900	- 25,200
North Las Posas							
Groundwater Demand	- 34,400	- 36,000	- 37,400	- 38,900	- 40,600	- 42,200	- 43,800
Inflow	+ 26,000	+ 26,000	+ 26,000	+ 26,000	+ 26,000	+ 26,000	+ 26,000
Change in Storage (Overdraft)	- 8,400	- 10,000	- 11,400	- 12,900	- 14,600	- 16,200	- 17,800
South Las Posas							
Groundwater Demand	- 7,300	- 7,200	- 7,000	- 6,800	- 7,000	- 6,600	- 6,600
Inflow	+ 7,900	+ 7,900	+ 7,900	+ 7,900	+ 7,900	+ 7,900	+ 7,900
Change in Storage (Surplus)	+ 600	+ 700	+ 900	+ 1,100	+ 900	+ 1,300	+ 1,300
Santa Rosa							
Groundwater Demand	- 600	- 600	- 600	- 600	- 600	- 600	- 600
Inflow	+ 1,000	+ 1,000	+ 1,000	+ 1,000	+ 1,000	+ 1,000	+ 1,000
Change in Storage (Surplus)	+ 400	+ 400	+ 400	+ 400	+ 400	+ 400	+ 400
GMA Total							
Change in Storage (Net Overdraft)	- 31,100	- 32,300	- 35,600	- 36,800	- 38,500	- 39,400	- 41,300

FIGURE 2



PROJECTED GROUNDWATER OVERDRAFT
IN THE GMA
GMA TOTAL
OXNARD PLAIN AND PLEASANT VALLEY BASINS
AND NORTH OFFSHORE SUB-BASIN
NORTH LAS POSAS BASIN
SANTA ROSA BASIN
SOUTH LAS POSAS BASIN
40,000
30,000
20,000
10,000
0
OVERDRAFT IN AF/YR
1980
1985
1990
1995
2000
2005
2010

LONG-TERM RECOVERABLE AND NON-RECOVERABLE STORAGE (UAS & LAS)

Recoverable storage may be defined as the quantity of groundwater which can be mined from an aquifer without causing serious damage. Within the GMA the major limitation is connection of fresh water aquifers with seawater along the entire Oxnard Coastal Plain. Here, seawater intrusion into the UAS constitutes an extremely serious problem and increased groundwater replenishment and reduced pumping of the UAS are the most effective methods of resolving the problem. These methods are key elements of the Oxnard Plain Seawater Intrusion Control Project now being constructed.

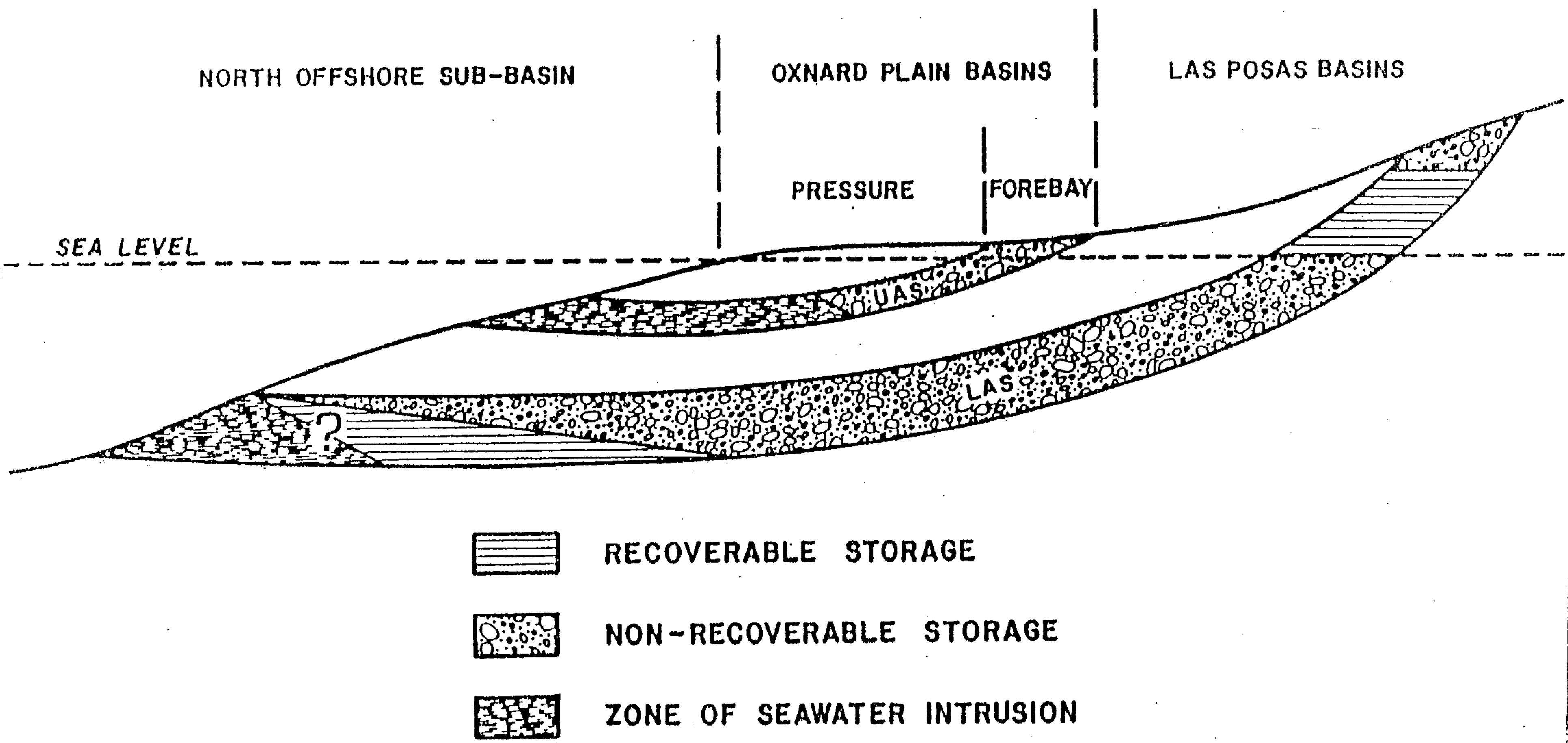
Basin management objectives are included in AB 2995 and Article 6 of this legislation requires the GMA to develop, adopt and implement a plan to control extractions from the UAS so that this overdraft will be eliminated by the year 2000. It also requires development of a contingency plan to deal with the occurrence of on-land seawater intrusion within the LAS. These legislative requirements significantly reduce the quantity of recoverable storage shown in Figure 3.

UPPER AQUIFER SYSTEM

The UAS consists of the intruded Oxnard aquifer zone and underlying Mugu aquifer. During the nine-year hydrologic base period 1970 through 1978 the average annual UAS overdraft was 12,400 AF. Because of this overdraft, which has caused the extremely serious seawater intrusion problem, there is no recoverable storage in the UAS. Total fresh non-recoverable

FIGURE 3

LONG-TERM RECOVERABE AND NON-RECOVERABLE GROUNDWATER STORAGE IN THE GMA



groundwater storage is more than 1.6 million AF as shown in Table 4.

LOWER AQUIFER SYSTEM

The LAS is a continuous system without significant barriers to groundwater underflow which underlies the entire GMA. As a result of this continuity, extractions in any one basin affect adjacent basins.

North and South Las Posas and Santa Rosa Basins Recoverable Storage

These basins constitute the easterly portion of the GMA as shown in Figure 1. Groundwater levels in portions of these basins are above sea level and for this study it was assumed that groundwater could be extracted until water levels in the area reach sea level. Using this criterion, the quantity of recoverable groundwater storage was calculated to be 580,400 AF. Of this amount, 563,500 AF occurs within the North and South Las Posas Basins and 16,900 AF is within the Santa Rosa Basin.

Oxnard Plain and Pleasant Valley Basins Recoverable Storage

The 1980 LAS water level map indicates that levels range from 120 feet below sea level at Camarillo to 80 feet above sea level near Saticoy. In these two basins 1980 LAS water levels averaged about 20 feet below sea level. The top of the LAS is also below sea level and is confined by a clay cap except for a small portion of the Oxnard Plain Forebay Basin. Low storage coefficient values indicate that limited extractions would significantly reduce water levels if these basins were

TABLE 4

LONG TERM RECOVERABLE AND NON-RECOVERABLE GROUNDWATER STORAGE IN THE GMA

Basin	1980 Groundwater Storage (AF)	Non-Recoverable Storage (AF)	Recoverable Storage (AF)
UAS			
Oxnard Plain	1,653,200 (100%)	1,653,200 (100%)	0
Subtotal	1,653,200	1,653,200	0
LAS			
North and South Las Posas	3,570,400 (100%)	3,006,900 (84%)	563,500 (16%)
Santa Rosa	103,600 (100%)	86,700 (84%)	16,900 (16%)
Oxnard Plain & Pleasant Valley	8,822,900 (100%)	8,822,900 (100%)	0 (0%)
North Offshore	4,919,200 (100%)	2,459,600 (50%)	2,459,600 (50%)
Subtotal	17,416,100 (100%)	14,376,100 (83%)	3,040,000 (17%)
TOTAL	19,069,300 (100%)	16,029,300 (84%)	3,040,000 (16%)

not hydraulically connected with the ocean. Consequently, long-term recoverable storage from any of these areas is negligible. Nonrecoverable storage in these two basins in 1980 was greater than 8.2 million AF.

North Offshore Sub-basin

Groundwater extracted from the LAS within the Oxnard Plain Pressure and Forebay and Pleasant Valley Basins is derived primarily from the North Offshore Sub-basin and onshore recharge.

Fresh groundwater storage in the North Offshore Sub-basin has been estimated to be approximately 4.9 million AF. It is not possible to calculate long-term recoverable storage in this basin because data regarding the position of the seawater intrusion front is not available. However, to provide an estimate for planning purposes, one-half of the total storage or 2.45 million AF was estimated to be recoverable. It should be emphasized that there is no practical method of determining exactly when seawater in the LAS will reach the coastline, so development of the seawater intrusion contingency plan as required by AB 2995 is necessary.

TOTAL RECOVERABLE STORAGE

As shown in Table 4, total 1980 recoverable LAS groundwater storage is estimated to be about 3 million AF. Of this amount about 0.5 million AF are recoverable from the North and South Las Posas and Santa Rosa Basins and about 2.5 million AF are estimated to be recoverable from the North Offshore Sub-basins. Although there is no recoverable storage in the Oxnard Plain and Pleasant Valley Basins, LAS water wells located in these basins will deplete storage from the North Offshore Sub-basin and other adjacent basins. If seawater does not reach the coastline in the LAS, recoverable groundwater storage will be adequate to supply current levels of extraction beyond the year 2010.

ADVERSE EFFECTS OF PROJECTED GROUNDWATER EXTRACTIONS

Substantial groundwater storage can be recovered from the LAS in North and South Las Posas, Santa Rosa and North Offshore Subbasins. Extraction of this recoverable storage will result in a lowering of groundwater levels resulting in increased pumping costs. It could also cause dewatering of aquifers and land subsidence.

GROUNDWATER LEVEL DECLINE

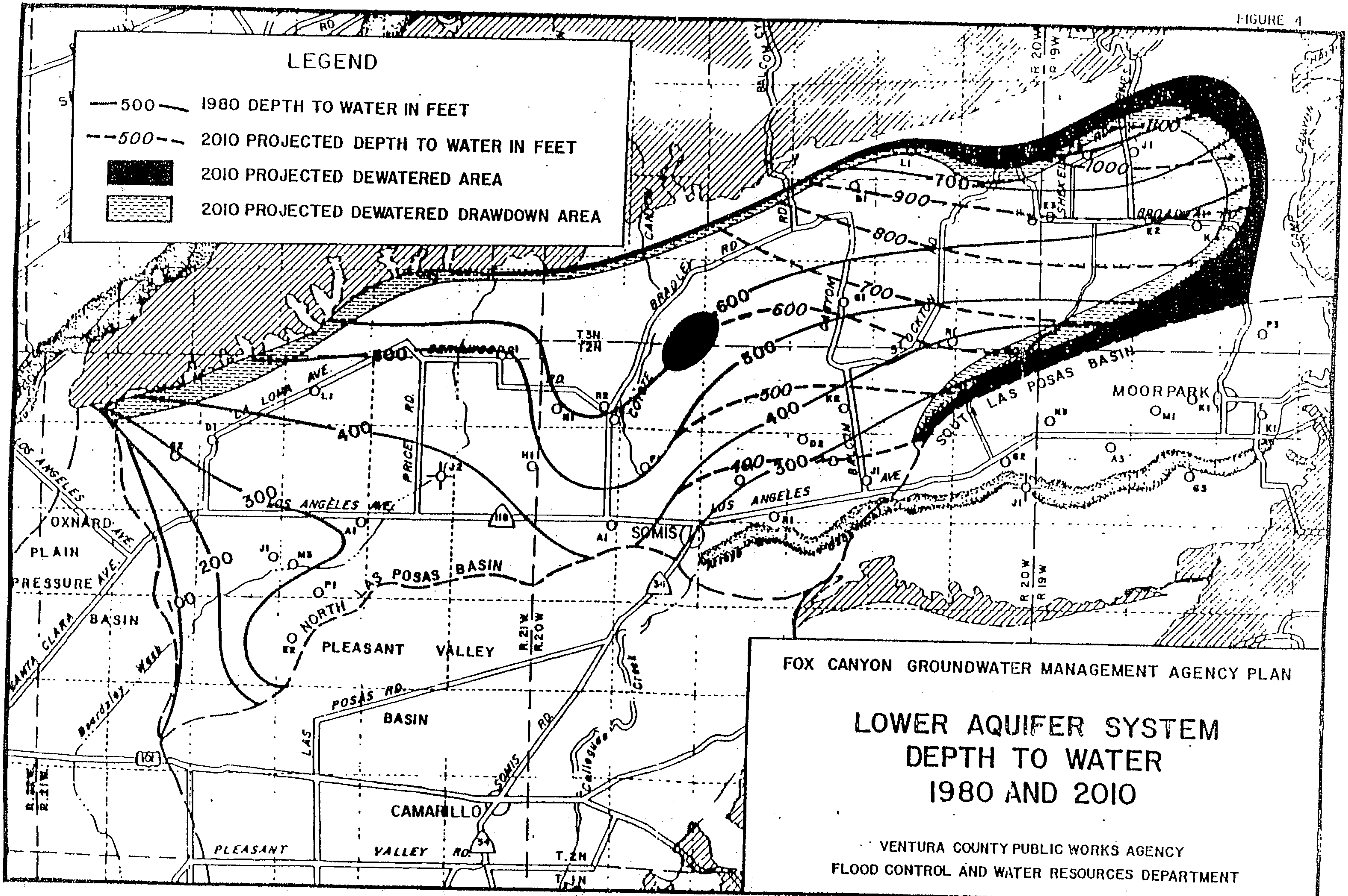
At projected rates of extraction, recovery of groundwater from the North Offshore Sub-basin will result in minimal lowering of water levels on the Oxnard Plain because seawater will replace extracted fresh water. The greatest lowering of groundwater levels will occur in the North Las Posas Basin where cumulative overdraft is projected to be 391,000 AF by the year 2010. By the year 2010, 97% of the recoverable storage will be mined as shown in Table 5. The depth to water in the North Las Posas Basin will vary from about 100 feet near the Oxnard Plain to about 1100 feet north of Fairview by the year 2010. The 1980 and projected year 2010 groundwater levels are shown in Figure 4.

TABLE 5

PROJECTED LAS POSAS VALLEY CHANGE IN GROUNDWATER STORAGE

Basin	1980 Recoverable Storage (AF)	Cumulative or Surplus 1980 - 2010 (AF)	Recoverable Storage Remaining By Year 2010 (AF)
North Las Posas	401,900 (100%)	-391,000 (97%)	10,900 (3%)
South Las Posas	161,600 (100%)	+ 29,250 (18%)	190,850 (118%)
Santa Rosa	16,900 (100%)	+ 12,000 (71%)	28,900 (171%)

FIGURE 4


LEGEND
500 1980 DEPTH TO WATER IN FEET
500 2010 PROJECTED DEPTH TO WATER IN FEET
2010 PROJECTED DEWATERED AREA
2010 PROJECTED DEWATERED DRAWDOWN AREA
FOX CANYON GROUNDWATER MANAGEMENT AGENCY PLAN
LOWER AQUIFER SYSTEM
DEPTH TO WATER
1980 AND 2010
VENTURA COUNTY PUBLIC WORKS AGENCY
FLOOD CONTROL AND WATER RESOURCES DEPARTMENT
MOORPARK
SOUTH LAS POSAS BASIN
NORTH LAS POSAS BASIN
PLEASANT VALLEY
BASIN
CAMARILLO
SOMIS
OXNARD PLAIN
PRESSURE
BASIN
LOS ANGELES AVE.
PLEASANT VALLEY RD.
LAS POSAS RD.
SOMIS RD.
PRICE RD.
LA LOMA AVE.
BRADLEY RD.
T.3N
T.2N
T.1N
R.21W
R.20W
R 19W
1100
1000
900
800
700
600
500
400
300
200
100

DEWATERED AREAS

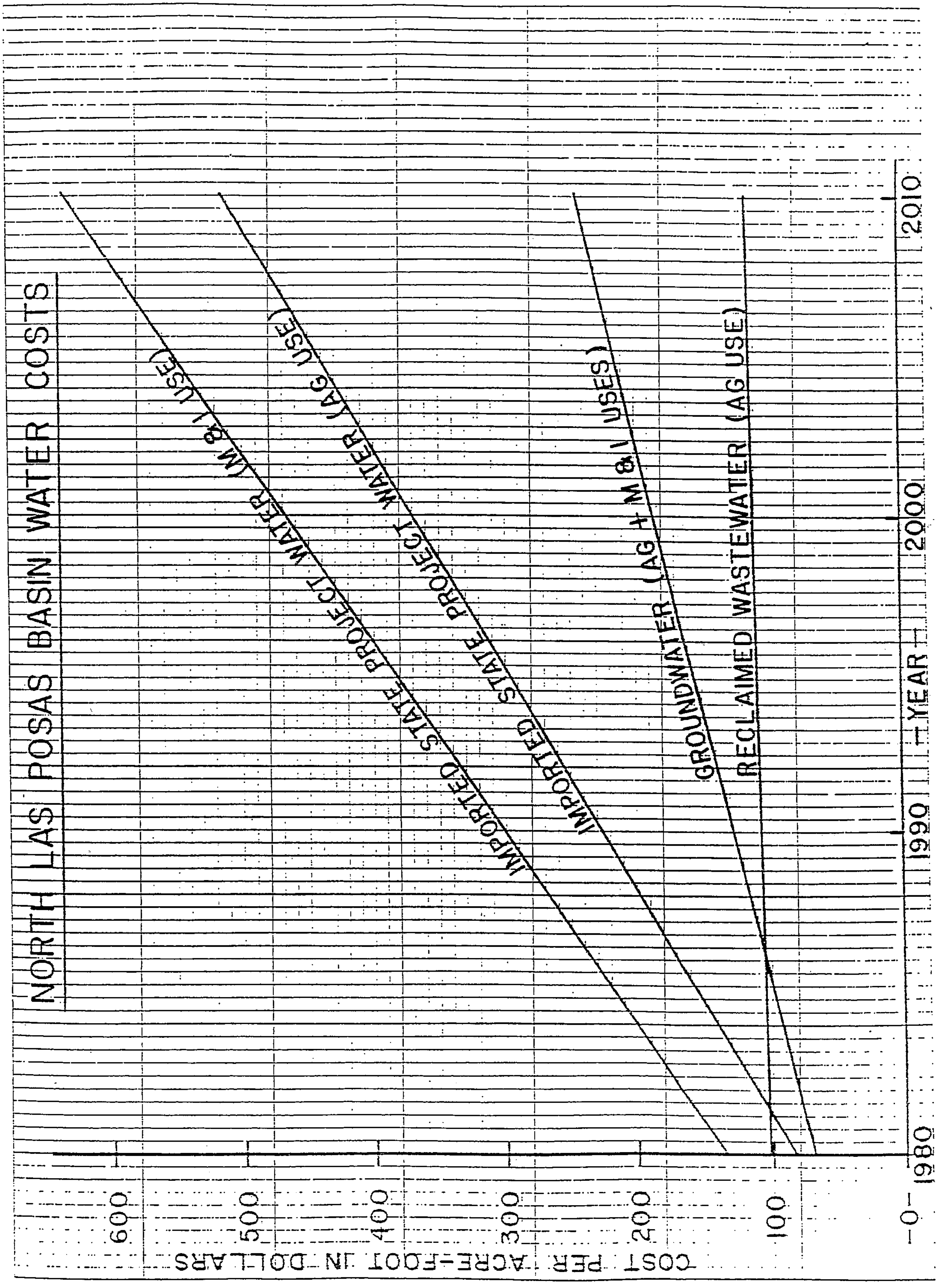
Areas that will be dewatered by the year 2010 are shown in Figure 4. Most of the dewatering will occur in the eastern periphery of the North Las Posas Basin where the dewatered area is projected to total 3.4 square miles. In addition, there will be dewatered area caused by drawdown from pumping wells. Drawdown will vary from 43 to 139 feet and will create an additional "dewatered drawdown area" of 3.3 square miles in the eastern periphery of the North Las Posas Basin (Figure 4).

The combined dewatered area will total 6.7 square miles which is 14% of the 1980 North Las Posas Basin water-bearing area. If projected groundwater extractions are allowed, supply of supplemental water to these dewatered areas should be considered.

GROUNDWATER PUMPING COSTS

Declining ground water levels increase the cost of pumping groundwater. The cost of power for pumping groundwater in the North Las Posas Basin was found to average $49/AF in 1980 and $173/AF by the year 2010. To determine the total cost of pumping, utility service charges and water well amortization costs must be added to power costs. Combining these costs results in an average 1980 total pumping cost of $70/AF. These combined costs were then projected to increase by 8.6% per year to the year 2010. In 2010 groundwater costs in the North Las Posas Basin are projected to range from $113 to $411/AF and average $241/AF. Average pumping costs for 1980 to the year 2010, are shown in Figure 5.

FIGURE 5



NORTH LAS POSAS BASIN WATER COSTS
IMPORTED STATE PROJECT WATER (M & I USE)
IMPORTED STATE PROJECT WATER (AG USE)
GROUNDWATER (AG + M & I USES)
RECLAIMED WASTEWATER (AG USE)
COST PER ACRE-FOOT IN DOLLARS
600
500
400
300
200
100
-0-
YEAR
1980
1990
2000
2010

WATER CONSERVATION - WASTE WATER RECLAMATION (UAS & LAS)

Two of the February 27, 1981 SWRCB grant conditions specify that UWCD and the County, as grantees, develop conservation and reclamation plans. The County prepared a "Water Conservation Management Plan" as part of the Countywide Planning Process. As part of this plan, agricultural and urban water conservation programs have been developed. Local agencies, cities and water purveyors are voluntarily responsible for implementing these programs. A "Water Conservation Coordinator" position has been established within the County Planning Department. The position is being funded jointly by the County, Casitas MWD, Calleguas MWD and UWCD. Agricultural and urban water conservation measures have been selected for implementation. They are summarized in previously completed GMA Task report 85-7. It is impossible to estimate precisely how much of this water can be saved through water conservation. If conservation practices reduce groundwater extractions by 10 percent as projected, total GMA pumpage could be reduced by 15,590 AF/yr as early as 1990 (Table 6).

Wastewater reuse was identified as part of the long-term solution to seawater intrusion in the 208 studies and the Countywide Wastewater Reuse Study. From all the water reclamation alternatives developed and studied by the County, two were recommended for further consideration. Both plans would supply reclaimed water to overdrafted groundwater basins within the GMA for irrigation use.

One of the plans could provide reclaimed water for the Las Posas area within the Berylwood Heights Mutual Water Company and

Table 6

FOX CANYON GROUNDWATER MANAGEMENT AGENCY

POTENTIAL CONSERVATION AND RECLAMATION BENEFITS

Basin		1985	1990	1995	2000	2005	2010
North Las Posas	Cons.	1,800	3,740	3,850	4,060	4,220	4,380
	Recl.	0	5,700*	6,170*	6,630	6,630	6,630
	Total	1,800	9,440	10,020	10,690	10,850	11,010
South Las Posas	Cons.	360	700	680	700	660	660
	Recl.	0	0	0	0	0	0
	Total	360	700	680	700	660	660
Santa Rosa	Cons.	30	60	60	60	60	60
	Recl.	0	0	0	0	0	0
	Total	30	60	60	60	60	60
Oxnard Plain & Pleasant Valley	Cons.	5,440	11,090	11,080	11,060	11,030	11,060
	Recl.	0	10,760	11,810	12,920	12,920	12,920
	Total	5,440	21,850	22,890	23,980	23,950	23,980
Total Cons.		7,630	15,590	15,670	15,880	15,970	16,160
Total Recl.		0	16,460	17,980	19,550	19,550	19,550
Total Cons. & Recl.		7,630	32,050	33,650	35,430	35,520	35,710

Note: Conservation Benefits assume savings of 5% on extractions in 1985 and 10% in all other years.

*Interpolated from Wastewater Reuse Study, pg. 11-1, 1986 5,330 AF/yr.

Other Reference: Wastewater Reuse Study, pg. 11-6, Table 11-3, TASK 84-5, Tables 3 & 4.

Zone Mutual Water Company service areas. The other plan would deliver reclaimed water from the Thousand Oaks/Hill Canyon Treatment Plant to the Oxnard Plain.

WATER RECLAMATION AND CONSERVATION BENEFITS

Within the North Las Posas Basin potential reclamation and conservation benefits for the year 1990 total 9,440 AF/yr (Table 6) which almost resolves the projected 1990 overdraft of 11,400 AF/yr. By the year 2010 the North Las Posas Basin overdraft is projected to increase to 17,800 AF/yr. At this time the total possible wastewater Reclamation-Water Conservation benefit is projected to be 11,010 AF/yr. If these proposed programs are fully implemented, the North Las Posas Basin overdraft would to be reduced to 6,790 AF/yr by the year 2010.

On the Oxnard Plain (Pleasant Valley Basin included) the future (year 2010) reclamation (12,920 AF/yr) and conservation (11,060 AF/yr) totals 23,980 AF/yr (Table 6). If these programs are successful they could theoretically eliminate the projected overdraft on the Oxnard Plain. Current (1985) overdraft on the Oxnard Plain (Pleasant Valley included) is 23,400 AF/yr for UAS and LAS combined. Future overdraft (year 2010) is projected to increase slightly to 25,200 AF/yr. Therefore, successful reclamation and conservation could provide a long-term solution for the Oxnard Plain area.

When benefits of proposed waste water reclamation-water conservation programs are combined, the total UAS and LAS GMA overdraft is reduced from 41,300 to about 5,600 AF/yr in the year 2010.

In the future there will be shifts from agricultural pumping to importation of water supplies as some areas become urbanized. Because urban areas can potentially conserve a higher percentage of water than agricultural uses (irrigation), future overdrafts may be reduced even further than projected, but only if the area urbanizes faster than anticipated. However, other unpredictable factors are involved, such as the availability of imported water for urban expansion. If urban areas have to revert back to pumping groundwater, the elimination of overdraft by reclamation and conservation would not be complete. The GMA encourages both wastewater reclamation and voluntary conservation as provided for in Sections 503 and 701 of the GMA legislation. Present (1986) and future (2005) reclamation costs based on 75% grant funding are shown in Figure 5. If 75% grant funding is available, wastewater reclamation projects should be implemented in the North Las Posas and Oxnard Plain Basins during the planning period.

IMPORTED WATER

Within the GMA imported State Project water is presently available from Calleguas Municipal Water District. Present (1984) and future costs of this water are shown in Figure 5. A recent policy of the Metropolitan Water District of Southern California, who supplies Calleguas MWD, is to prohibit new agricultural hookups because of anticipated shortages. As a result, this source is not considered reliable as a potential future supply for agricultural use in the GMA. However, in the future it may be possible to deliver a portion of UWCD'S 5,000 AF/yr State Project water entitlement to the Oxnard Plain.

UPPER AQUIFER SYSTEM MANAGEMENT PLAN

OXNARD PLAIN SEAWATER INTRUSION CONTROL PROJECT

In the 208 studies numerous projects and various sources of water supply were studied and evaluated. Project evaluations included extraction and injection type barriers, increased recharge, modified pumping patterns, direct surface-water deliveries, subsurface physical barriers and combinations of these alternative solutions.

The feasibility of developing alternative water supply sources was a major part of the 208 planning process. The 208 studies included development of local surface water supplies, imported state project water, groundwater, reclaimed wastewater, salt balance pumping from the Santa Paula Basin and comprehensive basin management. Developing local surface water supplies included a review of dam sites on Sespe Creek, UWCD proposed Quality Management Pipeline and Oat Mountain Diversion, and UWCD's proposed improvement to the Vern Freeman Diversion. The plan ultimately selected was improvement of the Vern Freeman Diversion and groundwater pumping from new LAS wells. The LAS pumping for irrigation is an interim supply until reclaimed wastewater can be made available. Under this plan water from the improved diversion and LAS wells will be delivered to the PTP service area.

In the process of planning for the diversion improvement, a total of three alternative bypass conditions were evaluated to determine potential water yields. The selected alternative 4D includes desilting facilities and the PTP. With this alternative there is a project yield of 11,566 AF/yr (70,662-59,096). A slight modification of the Pleasant Valley deliveries increase this yield to 12,740 AF/yr.

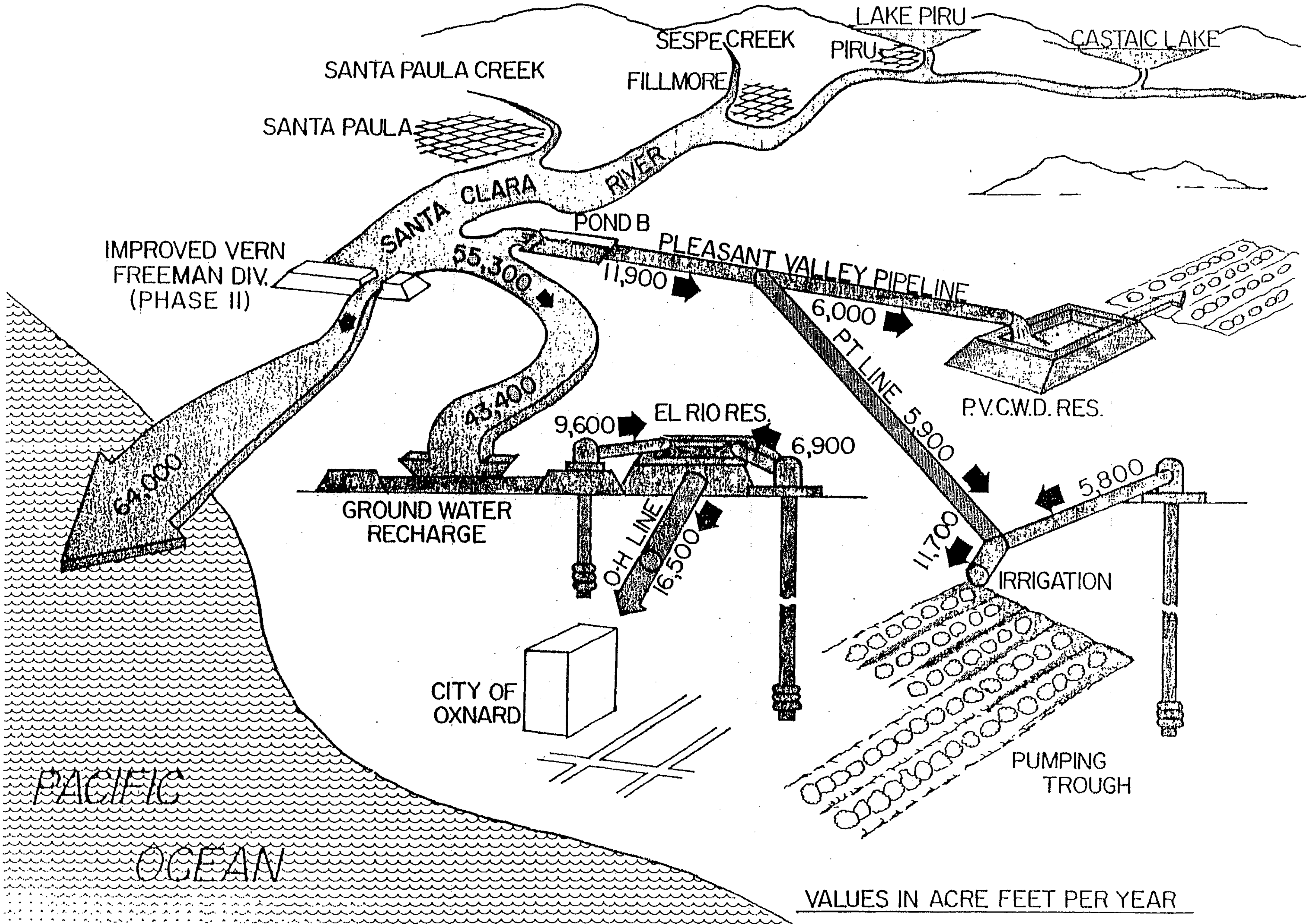
Pumping Trough Pipeline and Oxnard-Hueneme Pipeline Wells and the PTP

The PTP and O-H Pipeline wells are presently under construction and are considered the first phase of the overall project. The completed PTP will deliver water from the improved Vern Freeman Diversion and the five new LAS wells to the PTP service area. This area is located on the Oxnard Plain where about 50 Oxnard aquifer zone wells will be removed from service (Figure 6).

The PTP system includes a storage reservoir to help satisfy peak irrigation demands. The 18.6 AF reservoir is adjacent to Revolon Slough approximately one-half mile north of Sturgis Road. The project also includes three new LAS wells and a 12.4 AF balancing reservoir designed to meet increased M&I uses on the O-H Pipeline. The location of the new wells and reservoir are near Rose Avenue and the UWCD El Rio Pumping Plant.

Vern Freeman Diversion Improvement

The main feature of the proposed improvement will be an in-river diversion structure located in the Santa Clara River



OXNARD PLAIN AVERAGE ANNUAL WATER ALLOCATION
ALTERNATIVE 4D

FIGURE 6

just downstream of Todd Barranca. The structure is designed to safely bypass a standard project flood of 226,000 cfs. Auxiliary features of the diversion include intake gates and a conveyance canal. The canal will be restricted to the existing headworks capacity of 375 cfs. Other features include a fish ladder, fish screen and settling basins to clarify diverted storm flows that will be high in silt content, and a new moss screen.

OPERATING CRITERIA (UAS & LAS)

Operating criteria for the Seawater Intrusion Control Project were adopted on February 27, 1981 by the SWRCB as a condition of the $8 million State Assistance Program Grant for construction of the project. The criteria are included in the GMA Management Plan because they are a required element of the project. The operating criteria consist of six major categories describing the methods and priorities of project water allocation summarized as follows:

1. When available storage in the Oxnard Forebay is less than 80,000 AF priorities for surface water distribution shall be;
    a. First Priority - Delivery to the PTP.
    b. Second Priority - Pleasant Valley after PTP demands are met.
    c. Third Priority - Artificial replenishment to the Saticoy and El Rio Spreading Grounds.

2. When available storage in the Oxnard Forebay is greater than 80,000 AF priorities for surface water distribution shall be:

   a. First Priority - Artificial replenishment to the Saticoy and El Rio Spreading Grounds.

   b. Second Priority - Delivery to the PTP of water which is surplus to First Priority demands.

   c. Third Priority - Delivery to Pleasant Valley after PTP demands are met.

3. The O-H pipeline deliveries shall be as follows:

   a. When available storage space in the Oxnard Forebay is less than 80,000 AF, O-H demands shall be met by pumping UAS groundwater.

   b. When available storage space in the Oxnard Forebay is greater than 80,000 AF, O-H demands shall be met by pumping LAS groundwater.

4. When delivery of 12.22% of "supplemental water" to Pleasant Valley, calculated over a 20 year period, is not allowed, deviation from the above priority schedule may be required. In such cases the grantee shall provide the SWRCB with prior written notice and include the information in the required annual report.

5. Total surface and groundwater deliveries to the PTP shall not exceed 15,200 AF/yr.

6. The monitoring program described in Section III of the SWRCB special grant terms shall be used to determine movement of the seawater intrusion front. If the

seawater intrusion front moves inland, past the action line limit shown in Figure 7, the grantor shall initiate action(s) to reverse inland movement.

Project facilities and the allocation of Project water are shown in Figure 6.

WATER WELL ORDINANCE

In August 1970 the Board of Supervisors approved adoption of the County's first water well ordinance to protect water quality and conserve groundwater. This ordinance was revised August 20, 1985 and is now referred to as Ordinance No. 3739. Specifically, the purpose of the ordinance is to construct, maintain, repair and destroy water wells in such a manner that the groundwater of the County will not be contaminated or polluted.

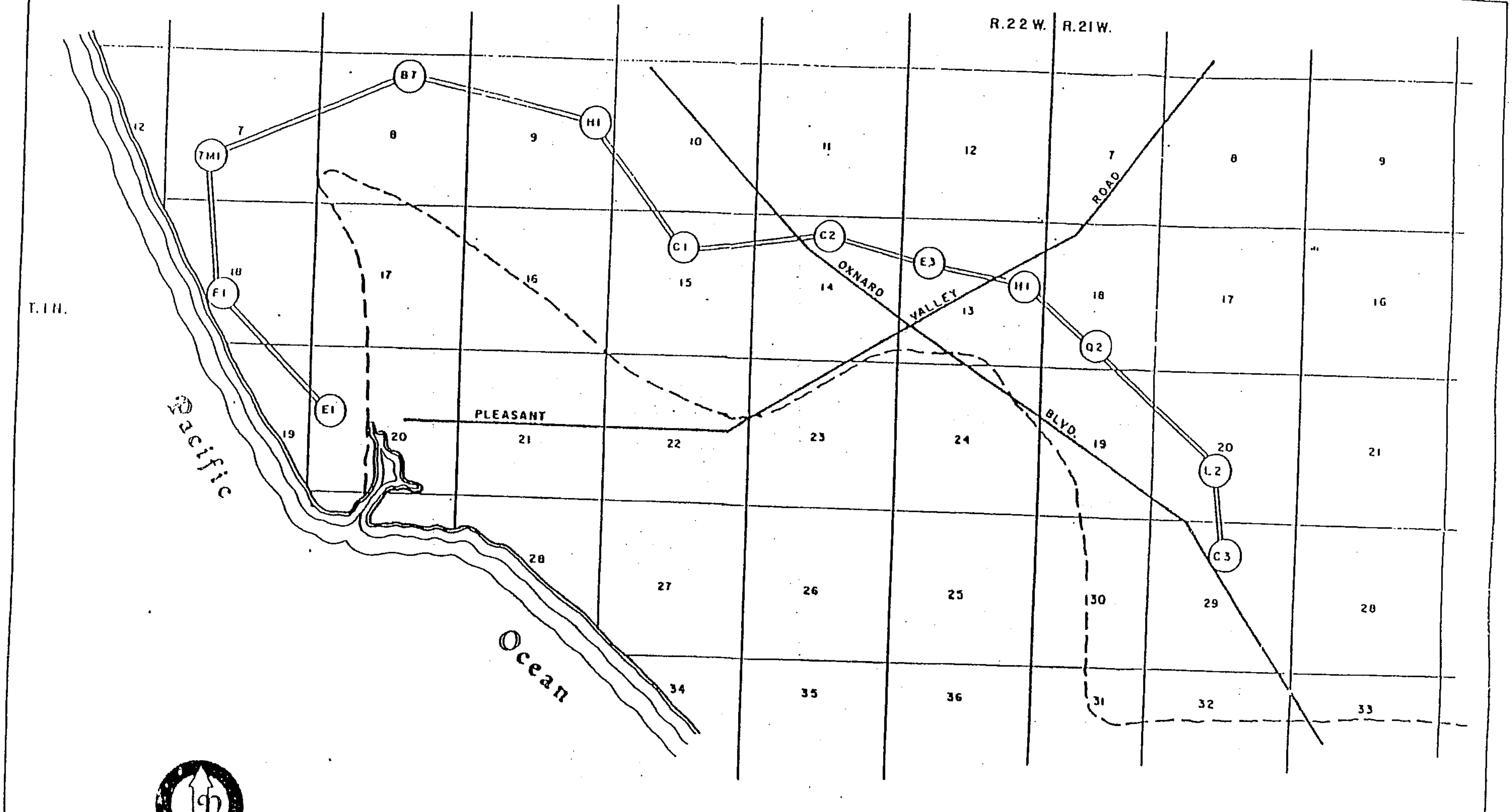
An important part of the ordinance restricts construction of new UAS wells on the Oxnard Plain which, if allowed, would increase groundwater overdraft and the rate of seawater intrusion into the Oxnard aquifer zone.

Ordinance No. 3698, Section 4820 (d) states, "--------- no permit shall be issued pursuant to Section 4813 for the construction, repair or modification of any well which is perforated in the Oxnard aquifer zone and/or the Mugu aquifer unless it is demonstrated to the satisfaction of the Director either that:

(1) there is no substantial possibility that use of the well will cause overdraft or seawater intrusion into an aquifer; or

(2) all of the following conditions apply: (i) the well is necessary to carry out seawater intrusion

FIGURE 7



LEGEND

ACTION LINE WATER QUALITY SAMPLING WELLS

SEAWATER INTRUSION (1980)

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER RIGHTS

OXNARD PLAIN SEAWATER INTRUSION AND ACTION LINE WELLS "

SCALE
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control programs and projects; (ii) the well has a casing diameter no greater than six inches; (iii) the pump will have no more than five horsepower; (iv) extraction will not exceed ten acre feet per year; and (v) the well will be used only for domestic purposes."

To help prevent additional overdraft of the UAS, Section 4820 of the ordinance should be retained.

ANNUAL GROUNDWATER MONITORING (UAS & LAS)

To meet the monitoring requirements of the SWRCB, special grant terms required a review and selection of seawater intrusion monitoring wells. The results of this review and a description of the new monitoring programs is contained in 208 Task Report 4.6.10.D. The recommended monitoring, which includes both water level measurements and water quality sampling, is a cooperative program between UWCD and VCFCD. A draft agreement has been prepared by VCFCD which describes the responsibilities of each party. This agreement should be executed by both parties to ensure continuation of the improved monitoring program and availability of data to the GMA.

In 1983 the monitoring of seawater intrusion was improved following the recommendations in Task Report 4.6.10.D. The 1983 monitoring results are described in a report prepared by VCFCD.

Monitoring for seawater intrusion includes a 10 1/2 mile long line of wells inland of the present seawater intrusion front. These ten "action line" wells are shown in Figure 7. If seawater intrusion extends past this line of wells, UWCD and the County are to notify the SWRCB and take preventive emergency action to reverse the intrusion.

There are other reports that summarize project operations and other monitoring programs. One is a reporting requirement for the SAP contract between UWCD and the SWRCB. Under the terms of this SAP contract, UWCD is required to submit annual reports to the SWRCB by January 15 following the water year in which the PTP becomes operational. In anticipation of that requirement, UWCD prepared its first annual report in June 1984 and submitted it to the SWRCB prior to the start up of the PTP project. The comprehensive report describes the operation of District facilities including records of daily quantities of water diverted for spreading or delivered to water users. There are sections covering the various components of the Seawater Intrusion Control Program, groundwater conditions, seawater intrusion and the District's expanded data collection program.

UWCD also reports each year on groundwater conditions, which is required when groundwater pump charges are levied (Div. 21, Part 9 of the Water Code). The annual report provides information on past, present and future overdrafts and estimates of present and future extractions.

Every two to four years VCFCD prepares a report of hydrologic data that includes the GMA area. These reports include data on water levels and water quality for both the UAS and LAS. Much of the data is depicted on hydrographs and maps.

The above reports and basic data on file with UWCD and VCFCD should provide most of the information necessary to prepare the annual report required under Section 502 of the GMA legislation. Section 502 also requires that the GMA report include information on supplemental water supplies and the plans for implementing groundwater management plans.

FUTURE UAS PLANNING

Implementation of the Seawater Intrusion Abatement Project, including the improvement of the Freeman Diversion, is expected to eliminate Oxnard aquifer zone overdraft. The present restrictions on drilling new UAS wells on the Oxnard Plain and the trend towards drilling more LAS wells will further reduce the UAS overdraft. Water conservation and wastewater reclamation projects may also be very effective in reducing both UAS and LAS overdrafts in the future.

Under these conditions management of the UAS can, for the present, be limited to monitoring groundwater conditions and evaluating the success of the Seawater Intrusion Control Project. If there is an overdraft condition in the UAS following completion and full operation of planned programs, then consideration of further restrictions on UAS pumping or development of additional water resources projects may be required.

IMPACTS OF REGULATING LOWER AQUIFER SYSTEM EXTRACTIONS IN THE NORTH LAS POSAS BASIN

Groundwater Level Decline

Regulation of LAS extractions will reduce groundwater level decline. LAS groundwater levels in the North Las Posas Basin are projected to decline to sea level by the year 2011 when all recoverable groundwater storage will be exhausted. At that time declines of up to 300 feet will occur in the area east of Balcom Canyon Road resulting in a static depth to water up to 1100 feet below ground surface (Figure 4).

Alternative Pumping Restrictions

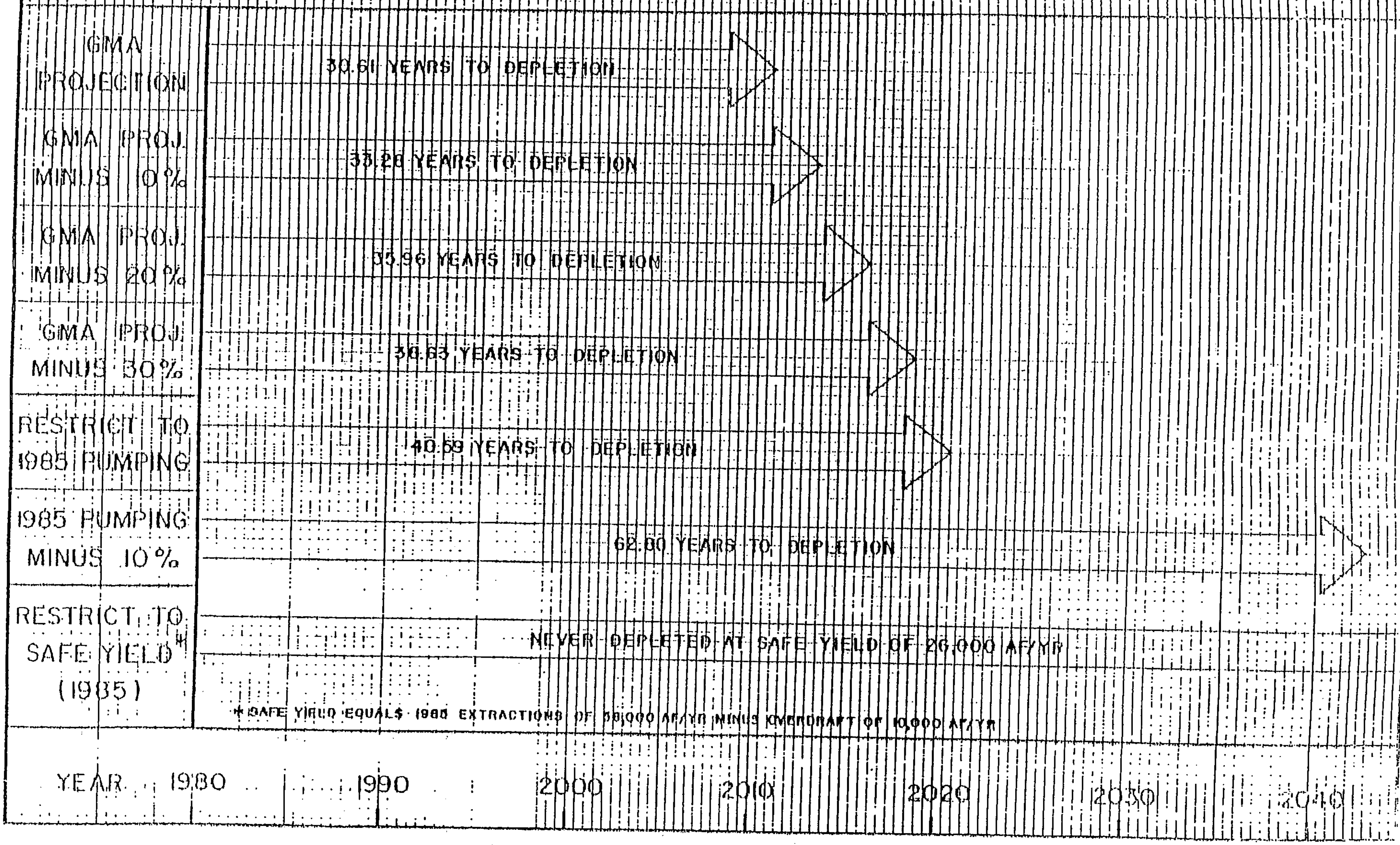
Figure 8, shows the time to depletion for seven levels of pumping restriction beginning with the base year 1980.

The first four alternatives compare the GMA projection with 10%, 20% and 30% reductions of the projection. The 20% and 30% reductions would probably be impossible without major changes in crop type or a reduction in irrigated acreage, but would extend the time to depletion to year 2019 which is eight years beyond the GMA projection.

A second type of alternative would limit groundwater extractions to existing (1985) pumping levels. Under this restriction, no new irrigated acreage would be allowed and the drilling of new irrigation wells would be prohibited. This would extend the time to depletion ten years beyond the GMA projection. A variation of this second alternative is to restrict each pumper to the 1985 levels of extraction minus

TIME TO DEPLETION OF RECOVERABLE GROUNDWATER STORAGE IN THE NORTH LAS POSAS BASIN

GMA TASK 85-4



* SAFE YIELD EQUALS 1985 EXTRACTIONS OF [illegible] AF/YR MINUS OVERDRAFT OF 10,000 AF/YR

10%. This would extend the time of depletion to the year 2043 which is 32 years beyond the GMA projection.

The last alternative considered was the 1985 safe yield restriction. For this alternative to be effective, present (1985) extractions would have to be reduced to 26,000 AF/yr. This could eliminate overdraft and extend basin life indefinitely. This would require a 28% reduction in water use for each pumper, which could not be achieved without crop type changes or a reduction in irrigated acreage.

Economic Impacts of LAS Pumping Restrictions

Restricting extractions could cause minor to severe economic impacts depending on the degree of restriction and the location of users.

Agricultural Users - Almost all agricultural water demand in the North Las Posas Basin is met by groundwater, which is usually the least costly and, in a few areas, the only source of supply. Some possible economic impacts on agriculture users are:

1. Reduced irrigated acreage - It may be possible to reduce LAS extractions by 10% without adversely affecting irrigated agriculture. However, reducing LAS extractions basin-wide by 20% to 30% would probably require users to reduce irrigated acreage if the same crop type is grown and there is no supplemental water available. This could reduce farm yields and income.
2. Lower Water Use Crops - If the 20% to 30% LAS extraction reduction is imposed and irrigated acreage is not reduced, conversion to a crop requiring less applied

water would be necessary unless adequate supplemental water is available. Because lower water-use crops generally have a lower market value, farm income would probably be reduced.

3. Prohibit New Irrigated Acreage and New Irrigation Wells -

   Prohibition of new irrigated acreage and wells could have severe economic impacts upon owners of undeveloped land. The greatest adverse impacts would be upon owners of high value, non-irrigated prime agricultural lands.

4. Reduction In Irrigated Agricultural Units - Substantial pumping restrictions could cause irrigated agriculture to become permanently unprofitable where cost-effective alternative water supplies are not available.

   In these areas irrigated agriculture would no longer be an economically viable land use and would probably be discontinued. The land could be converted to dry farming or M&I uses. Dry farming, which generally produces less income, would possibly not be economically feasible. In areas where adequate quantities of more costly imported water are available and other requirements are met, M&I uses could be developed.

5. Reduced Groundwater Pumping Costs - Restriction on pumping could reduce or eliminate future groundwater level declines and decrease the cost of groundwater extraction. It could reduce power costs by 26% in

parts of the North Las Posas Basin if the most restrictive "safe yield" alternative was selected.

<u>Municipal & Industrial Users</u> - Although the economic impact of a severe (20% to 30%) LAS pumping restriction on M&I users would be significant, it would be less serious than agricultural restrictions. A less severe economic impact to M&I users would generally occur because most are currently served by imported water and because less of their budget is needed for water supply. Some possible impacts on M&I users are:

1. <u>Additional Water Importation</u> - A restriction on water extracted for M&I use could result in an increased demand for imported water. Unless new water projects are developed, imported water supplies may not be available to meet these needs.
2. <u>Increased Water Cost</u> - Additional importation or development of alternative water supplies, in lieu of groundwater pumping, could result in higher costs for water and the need for additional conveyance facilities.
3. <u>Limited M&I Growth</u> - If groundwater pumping is restricted and sufficient quantities of supplemental water are not available, M&I growth will eventually be curtailed. An effective water conservation program would only delay the need to limit M&I growth. Limiting M&I growth because of inadequate water supply would probably result in serious areawide adverse economic impacts.

4. Reduced Groundwater Pumping Costs - Restrictions on pumping could reduce the cost of pumping by reducing water level declines and pumping lifts.

CONTINGENCY PLAN FOR ON-LAND SEAWATER INTRUSION INTO THE LOWER AQUIFER SYSTEM

Article 6 of the GMA legislation requires that a contingency plan be adopted to deal with possible onland seawater intrusion within the LAS as part of the "LAS Management Plan". Knowledge of where and when onland seawater intrusion will occur in the LAS would be helpful in developing the contingency plan; however, data to accurately make this determination are not available.

LAS Water Quality Monitoring

Because it is not possible to accurately predict the location and timing of LAS onshore seawater intrusion, the contingency plan must include continuing groundwater quality monitoring. A program of this type will alert investigators when onland seawater intrusion occurs.

Presently, both UAS and LAS wells on the Oxnard Plain are being monitored annually for water quality changes including evidence of seawater intrusion. In 1983 an improved seawater intrusion monitoring program was initiated as a requirement of the SWRCB eight million dollar grant for the PTP Project. This is a cooperative program with monitoring responsibilities shared between VCFCD and UWCD. A draft agreement has been prepared which should be executed by both parties to ensure continuation of the improved monitoring programs and availability of data to the GMA. UWCD also prepares several annual reports that include data on groundwater conditions.

Although the above programs will be very helpful in assessing the status of water resources, they are not considered adequate to provide early warning of seawater intrusion in the LAS because not enough wells are located near the coastline. To resolve this problem, four new LAS monitoring wells are proposed at tentative locations shown in Figure 9. Funding for construction and monitoring of these wells could be provided by either UWCD, VCFCD, the GMA or a combination of these agencies.

Contingency Plans

Following the confirmation and reporting of onland intrusion in the LAS, it will be the responsibility of the GMA, with County and UWCD assistance, to officially inform the public of the need to initiate contingency plans. Proposed "Contingency Plans" are shown in Table 7.

These plans would be staged with timing and effort dependent upon the severity of onland seawater intrusion. The initial stage 1 plan includes the possibility of taking LAS wells which are very near the intrusion front out of service, requiring metering, drilling additional LAS monitoring wells and increasing monitoring frequency. Voluntary conservation and wastewater reclamation will be effective if the Water Conservation Management and Wastewater Reclamation Plans are implemented.

If the intrusion is persistent and coastal LAS wells become intruded, stage 2 plans will be implemented. Stage 2 requires that restrictions be placed on drilling new LAS wells near the

TABLE 7

LOWER AQUIFER SYSTEM CONTINGENCY PLAN

Monitoring Results	Physical Conditions	Planning Stage	Additional Monitoring (Policy)	LAS Drilling Moritorium (Ordinance)	Conservation-Reclamation (Policy)	Pumping Restrictions (Ordinance)	Alternate Water and Emergency Supply (Policy)
Onland intrusion in LAS	First indication of LAS problem	1	Request UWCD & County to increase frequency of monitoring in intruded area & require metering. Drill additional LAS monitoring wells.	Consider LAS drilling restrictions. Define areas.	Request voluntary conservation - reclamation.	Implement voluntary conservation. Consider Ag. pumping restrictions and restriction areas.	Review legislation and ways to fund other agency water projects. Review and plan for alternative water supplies. Assist agencies with project construction.
Expanded intrusion with some LAS wells out of service	Problem serious for some LAS owners	2	Request UWCD & County to expand monitoring. Consider drilling additional monitoring wells.	Enforce drilling restrictions on new wells. Allow replacement wells only.	Request cities & County to expand conservation efforts. Hold workshop sessions. Require wastewater reclamation for Ag.	Implement Ag. pumping restrictions in identified areas. Consider M&I conservation restrictions.	
5 mi.^{2} intruded 5% of LAS wells (10-15 wells) intruded and and out of service	Problem becomes severe. Without effective controls intrusion will spread.	3	Request UWCD & County to expand monitoring. Drill additional wells.	Expand drilling restriction area. Allow replacement wells only.	Request cities & County to develop and implement mandatory conservation plans with fines	Implement M&I restrictions. Implement GMA water duty on Ag. Prepare GMA-wide restrictions.	Assist agencies to apply for grant funding and implement new water projects.
10 mi.^{2} intruded 10% of LAS wells (20-25 wells) intruded and out of service	Problem very severe. Intrusion nearly out of control.	4	Request UWCD & County to expand monitoring. Drill additional monitoring wells.	Expand drilling restriction to entire GMA area. Allow replacement wells only.	Request cities & County to prohibit new construction and new water line connection.	Enforce GMA-wide pumping restrictions for Ag. and M&I.	Assist other agencies with emergency plans, projects and grant funding.
Extensive LAS intrusion. Many LAS wells out of service.	Very severe economic impacts. Intrusion out of control.	5	Request UWCD & County to expand monitoring. Drill additional monitoring wells.	Complete ban on all new M&I and Ag. wells.	Prohibit all new construction and new water service connections	Enforce GMA-wide pumping restrictions for Ag. and M&I.	

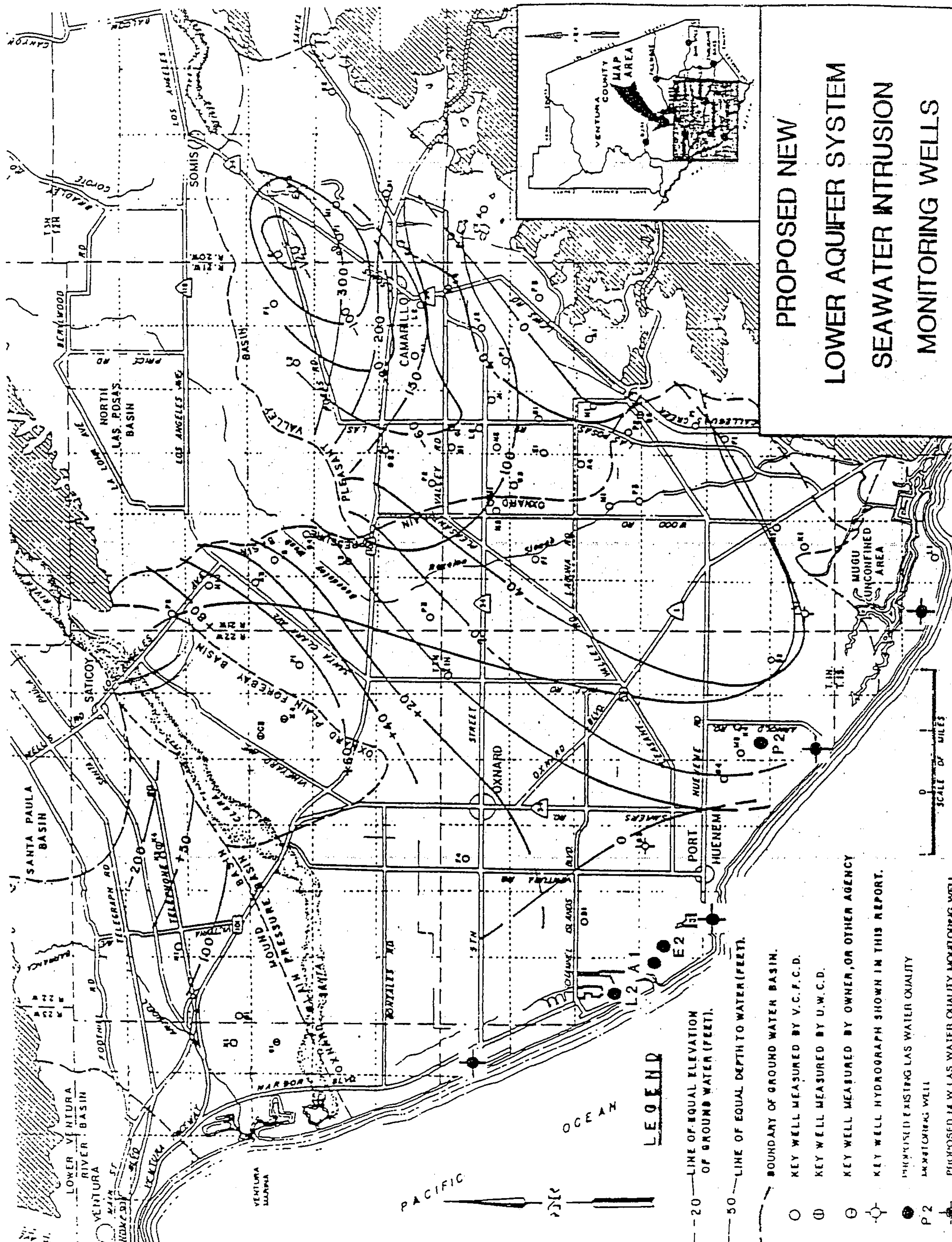

PROPOSED NEW
LOWER AQUIFER SYSTEM
SEAWATER INTRUSION
MONITORING WELLS
VENTURA COUNTY
MAP AREA
SANTA PAULA BASIN
SATICOY
SOMIS
NORTH LAS POSAS BASIN
CAMARILLO
PLEASANT VALLEY BASIN
OXNARD PLAIN FOREBAY BASIN
OXNARD
PORT HUENEME
MOUND BASIN
OXNARD PLAIN PRESSURE BASIN
MUGU UNCONFINED AREA
LOWER VENTURA RIVER BASIN
VENTURA
PACIFIC OCEAN
L2
A1
E2
P2
SCALE OF MILES
LEGEND
20 LINE OF EQUAL ELEVATION OF GROUND WATER (FEET).
50 LINE OF EQUAL DEPTH TO WATER (FEET).
BOUNDARY OF GROUND WATER BASIN.
KEY WELL MEASURED BY V.C.F.C.D.
KEY WELL MEASURED BY U.W.C.D.
KEY WELL MEASURED BY OWNER, OR OTHER AGENCY
KEY WELL HYDROGRAPH SHOWN IN THIS REPORT.
MONITORING WELL

FIGURE 9

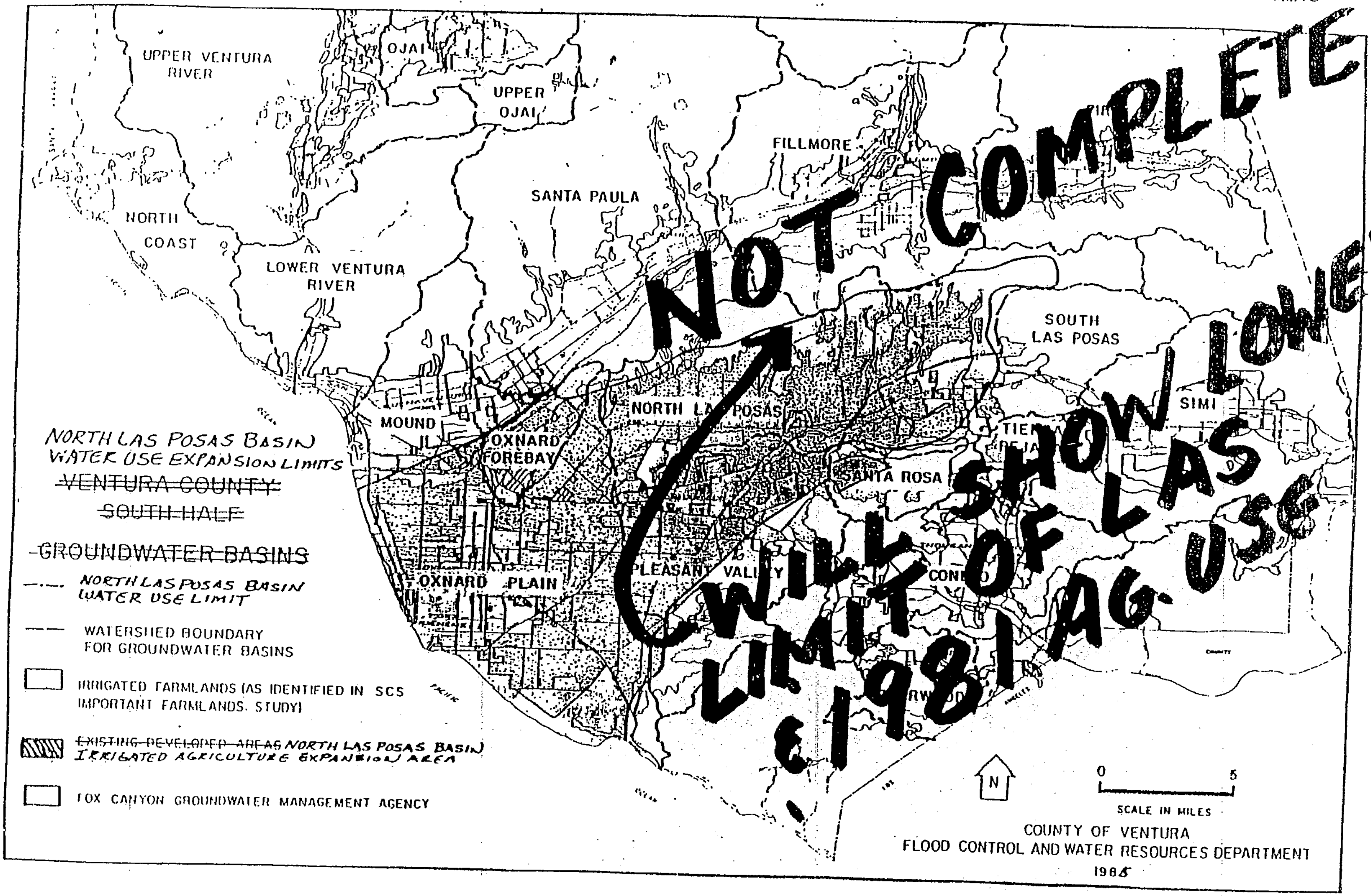
North Las Posas Basin Pumping Restriction

Overdraft in the North Las Posas Basin is projected to total 10,000 AF/yr in 1985 and increase to 17,800 AF/yr by the year 2010. In 1980, recoverable storage in the basin was calculated at 401,900 AF. GMA projections indicate that virtually all of this storage (391,000 AF) will be extracted by the year 2010.

To ensure that groundwater supplies are available until at least the end of the planning period (year 2010), it is recommended that future extractions in the North Las Posas Basin be limited to the restriction alternative shown in Tables 1 and 2. These projections are based upon the requirement that expansion of irrigated agriculture will only be allowed on presently unused land south of the outcrop (surface exposure) of the LAS. Expansion of all types of water use to land on or topographically above the LAS outcrop will be prohibited. This restriction will limit North Las Posas Basin expansion of irrigated agriculture to 7.87 square miles (5,037 acres) by the year 2010 as shown in Figure 10. (More accurate larger scale maps are available at the VCFCD).

The GMA will adopt an ordinance to regulate drilling of new LAS water wells in the North Las Posas Basin. Prohibiting construction of new LAS irrigation wells will not in itself guarantee achievement of the GMA projection alternative selected for the North Las Posas Basin. This is because more water could be extracted from existing wells to supply additional irrigation or M&I demands. Additional agricultural demands could result from increased irrigated acreage or a shift to higher water use crops. A shift to higher water use crops could become a problem in the

FIGURE 10


UPPER VENTURA RIVER
OJAI
UPPER OJAI
FILLMORE
SANTA PAULA
NORTH COAST
LOWER VENTURA RIVER
MOUND
OXNARD FOREBAY
NORTH LAS POSAS
SOUTH LAS POSAS
SIMI
SANTA ROSA
PLEASANT VALLEY
OXNARD PLAIN
NOT COMPLETE
WILL SHOW LOWER
LIMIT OF LAS AG USE
€ 1981
NORTH LAS POSAS BASIN
WATER USE EXPANSION LIMITS
~~VENTURA COUNTY~~
~~SOUTH HALF~~
~~GROUNDWATER BASINS~~
NORTH LAS POSAS BASIN WATER USE LIMIT
WATERSHED BOUNDARY FOR GROUNDWATER BASINS
IRRIGATED FARMLANDS (AS IDENTIFIED IN SCS IMPORTANT FARMLANDS. STUDY)
~~EXISTING DEVELOPED AREAS~~ NORTH LAS POSAS BASIN IRRIGATED AGRICULTURE EXPANSION AREA
FOX CANYON GROUNDWATER MANAGEMENT AGENCY
N
0
5
SCALE IN MILES
COUNTY OF VENTURA
FLOOD CONTROL AND WATER RESOURCES DEPARTMENT
1985

remainder of the GMA without the recommended pumping restrictions which follow.

Pumping Restrictions (UAS & LAS)

Future groundwater extractions within the entire GMA will be carefully monitored semi-annually by the GMA Board to ensure that they do not exceed adopted projections. Provision for limiting extractions will be included in the new water well permit system.

If recommended monitoring indicates that GMA projections are being exceeded when adjusted to an average annual water use basis in any GMA basin, a limit or "water duty" will be established for each parcel of land in that basin. An initial limit or allotment of 2.7 AF/ac/yr should be adopted for the Oxnard Plain and Pleasant Valley areas where truck crops are grown and an initial unit water use value of 1.9 AF/ac/yr should be adopted for other GMA areas where citrus and avocados are grown. If GMA projections are exceeded by M&I users when adjusted to an average annual water use basis, the quantity of groundwater pumped for M&I use should also be limited to the GMA adopted unit amounts presented in Table 2.

This type of program will probably require metering and establishment of accurate historical use before such a program can be effectively implemented by an appointed Watermaster. The Ventura County Flood Control and Water Resources Department could act as Watermaster under the direction of the GMA.

Implementation of Drilling and Pumping Restrictions

The existing County Water Well (drilling) Ordinance system can probably be amended to implement drilling and pumping re-restrictions. One possible advantage of using the existing ordinance is that it would be easier to modify than initiating an entirely new GMA ordinance. Administration of a modified ordinance could be performed by the VCFCD by amending the GMA's existing County contract.

When the drilling and pumping restriction ordinance is adopted, a copy of the ordinance should be included with the mailing of semi-annual groundwater extraction statements to notify all well owners. Well drillers should also be notified. Any adopted GMA ordinances should go into effect with the GMA Management Plan starting January 1, 1986.

Monitoring and Enforcement of Restrictions (UAS & LAS)

The drilling and extraction of water from wells must be accurately monitored to ensure compliance with GMA restrictions.

In the North Las Posas Basin, water well drilling permits must be reviewed to determine the proposed location and quantity of water use. If the water is to be used on or topographically above the LAS outcrop or will cause the total quantity of water used in the North Las Posas Basin to exceed the GMA projection, when adjusted to an average annual water use basis, the drilling permit will be denied.

Within the entire GMA, extractions of each well will be accurately monitored and totaled for each groundwater basin semi-annually by the GMA. If total extractions for any basin exceed the GMA projection when adjusted to an average annual water use basis, implementation of the previously described agricultural "water duty" limitation, and M&I unit water use values shall be imposed upon individual groundwater pumpers exceeding these amounts.

When onshore seawater intrusion of the LAS is detected, the GMA will immediately implement Stage 1 of the contingency plan. Additional restrictions shown in Table 7 will be imposed in stages until seawater intrusion of the LAS is controlled.

To enforce the above restrictions the GMA Board must adopt an ordinance pursuant to Section 403 of AB 2995. This Section requires a noticed public hearing and majority vote of the Board. In emergency situations, where public health, safety or welfare so requires, the Board may immediately adopt ordinances.

Sections 404 and 405 of AB 2995 specify that persons who violate agency ordinances may be required to pay a fine to the agency not to exceed five hundred dollars, and be liable civilly to the agency for a sum not to exceed one thousand dollars per day for each day of violation. If the violation continues, Section 406 provides that the agency may petition the superior court for a temporary restraining order, preliminary or permanent injunction, or other appropriate equitable relief.

Metering Requirements (UAS & LAS)

Section 804 of AB 2995 allows the GMA to require metering of all water wells. Section 804 states: "The agency may, by ordinance, require extraction facilities to be equipped with water flow measuring devices installed and calibrated by the agency, or at the agency's option, by the extraction facility operator."

To be effective the recommended pumping restrictions will require metering of extractions and regulation by an appointed Watermaster. The Ventura County Flood Control District could act as Watermaster under the direction of the GMA Board. The metering requirement will be included in the modified County water well ordinance or a new GMA water well ordinance.

In areas of the GMA where pumping restrictions are imposed throughout the basin, the GMA will require that all water wells extracting more than 10 AF/yr be equipped with accurate flow meters. Metering requirements will be imposed in basins where GMA water use projections are being exceeded or to implement the LAS Contingency Plan.

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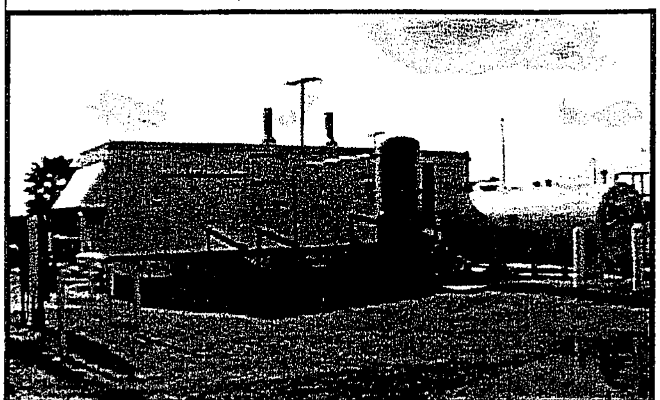
Appendix B

2003 Consumer Confidence Report

United Water Conservation District

Oxnard-Hueneme Water Delivery System

2003 Consumer Confidence Report



The 750kW generator installation was completed last year to provide emergency power to the O-H Wellfield.

Testing and Results

Last year we conducted thousands of tests for over 180 chemicals and contaminants that could be found in your drinking water. We did not detect any contaminants that would make the water unsafe to drink. This report highlights the quality of water we delivered to our customers last year. Included are details about where your water comes from, what it contains, and how it compares to State standards. For more information about your water, please call our Operations Manager, Jim Kentosh, at (805) 525-4431.

Public Meetings

Our monthly board meetings are usually held on the second Wednesday of every month at 1:00 PM in our board room at 106 North 8th Street in Santa Paula. Our meetings are open to the public and we would welcome your questions and comments.

About Your Water Supply

United Water's Oxnard-Hueneme Delivery System supplies about 13,000 acre-feet of water per year to several agencies in the Oxnard Plain, including the cities of Oxnard and Port Hueneme, two Naval bases, and several smaller water companies. Those agencies supply our water to over 205,000 people, most of it treated or blended with other supplies. Our water source is 100% local groundwater, pumped from wells near El Rio, north of Oxnard. Water from those wells has its origin in the mountains and valleys of the 1,600 square mile Santa Clara River watershed. The wells are in an aquifer called the Oxnard Forebay. Our water is naturally high in minerals that affect its taste, but is safe to drink. Our groundwater is considered to be "under the influence of surface water," which means we do extensive monitoring of turbidity and other parameters to meet health regulations. Water produced by our wells is naturally filtered through the ground. We use chlorine as a disinfectant to kill bacteria, parasites and viruses. Then we add chloramines to provide a long-lasting disinfection residual to keep the water safe until it reaches our customers. Due to the longer-lasting residual of chloramines, owners of pet fish must treat their tap water before putting it into aquariums or ponds.

United Water Conservation District
106 North 8th Street
Santa Paula, CA 93060
805/525-4431 Fax 805/525-2661
www.unitedwater.org

Types of Potential Contamination

In general, sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

Radioactive contaminants, which can be naturally-occurring or be the result of oil & gas production and mining activities.

In order to ensure that tap water is safe to drink, the California Department of Health Services prescribes regulations that limit the amount of certain contaminants in public drinking water. We treat our water to meet these health regulations. The Department's regulations also establish limits for contaminants in bottled water, which must provide the same protection for public health. Scientists and health experts are continually studying the effects of various chemicals in drinking water to make sure the public water supply is safe.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (1-800-426-4791).

Definitions

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Primary Drinking Water Standard: MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Detection Limit for Reporting (DLR): The level above which a chemical is to be reported.

N/A: not applicable
ppm: parts per million, or milligrams per liter
ppb: parts per billion, or micrograms per liter
ND: none detected
pCi/L: picocuries per liter (a measure of radioactivity)

Turbidity

Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our water treatment. Turbidity is measured in units called NTU's. We achieved 100% compliance with turbidity standards in 2003.

Water Quality Data

The table below lists all of the drinking water contaminants that we detected during the 2003 calendar year. The presence of these contaminants in the water does not indicate that the water poses a health risk. In addition to the contaminants on the table, we tested for many other chemicals which were not detected at significant levels. Please call us if you would like a copy of the complete list of chemicals we tested for and the test results.

Total Dissolved Solids and Sulfate

Total Dissolved Solids, or TDS, is a measure of the total mineral content of the water. TDS and sulfate are secondary standards related to the taste of the water, and water exceeding the MCL is generally safe for human consumption. Our water exceeds the secondary standards for TDS and sulfate because of naturally occurring minerals in the water.

Contaminants Detected in 2003

Chemical	MCL	PHG or (MCLG)	DLR	Units	Range	Avg	Date	Major Sources in Drinking Water
Primary Standards - Inorganic Chemicals								
Arsenic	50		2	ppb	ND -3	1.5	2004	Erosion of natural deposits. Runoff from waste.
Fluoride	2	1	0.1	ppm	0.4 - 0.7	0.55	2004	Erosion of natural deposits.
Nitrate (as NO_3)	45	45	2	ppm	10.6 - 17.7	14.25	2004	Leaching from fertilizers and septic systems.
Nitrate + Nitrite (as N)	10,000	10,000	400	ppb	2800 - 3500	3280	2004	Leaching from fertilizers and erosion of natural deposits.
Selenium	50	50	5	ppb	5 - 11	8	2004	Erosion of natural deposits. Discharge from mines, runoff from livestock lots.
Primary Standards - Disinfection By-Products								
Total Haloacetic Acids	60	N/A	N/A	ppb	ND - 9	6	2004	By-product of drinking water chlorination.
Monobromacetic Acid	N/A	N/A	1	ppb	ND - 1	0.06	2004	By-product of drinking water chlorination.
Dibromoacetic Acid	N/A	N/A	1	ppb	5 - 8	6	2004	By-product of drinking water chlorination.
Total Trihalomethanes	100	N/A	0.5	ppb	15.5 - 42	26.5	2004	By-product of drinking water chlorination.
Bromodichloromethane	N/A	N/A	0.5	ppb	1.2 - 3.3	2	2004	By-product of drinking water chlorination.
Bromoform	N/A	N/A	0.5	ppb	8.8 - 23.8	15.3	2004	By-product of drinking water chlorination.
Chloroform	N/A	N/A	0.5	ppb	ND - .8	0.18	2004	By-product of drinking water chlorination.
Dibromochloromethane	N/A	N/A	0.5	ppb	6.6 - 14.1	9	2004	By-product of drinking water chlorination.
Primary Standards - Clarity								
Delivered water turbidity	5	N/A	N/A	NTU	0.06 - 0.16	0.099	2004	Well corrosion byproducts. Microscopic soil particles.
Primary Standards - Radioactivity								
Gross Alpha	15	(0)	1	pCi/L	4.42 - 8.94	7.1	2004	Decay of natural deposits.
Gross Beta	50	0	4	pCi/L	8.0 - 8.0	8	1995	Decay of natural deposits.
Uranium	20	(0)	2	pCi/L	7.38 - 7.38	7.4	2001	Decay of natural deposits.
Radon	N/A	N/A	100	pCi/L	8.34 - 337	214	2004	Decay of natural deposits.
Secondary Standards								
Sodium	N/A	N/A	1	ppm	95 - 102	98.5	2004	Leaching from natural mineral deposits. Seawater influence.
Sulfate	500	N/A	5	ppm	471 - 514	490	2004	Leaching from natural mineral deposits. Leaching from agricultural applications.
Total Dissolved Solids, TDS	1,000	N/A	40	ppm	980 - 1090	1037	2004	Leaching from natural mineral deposits.
Total Hardness	N/A	N/A	N/A	ppm	543 - 568	555	2004	Leaching from natural mineral deposits.
Unregulated Chemicals								
Boron	N/A	N/A	50	ppb	600 - 670	635	2004	Erosion of natural deposits.

* Exceeds the MCL

Note: No positive coliforms were detected in the distribution system in 2003

Source Water Assessment

United Water completed a Source Water Assessment for its drinking water wells in October 2001. This report is available for public review at our office in Santa Paula. The assessment provides a survey of potential sources of contamination of the groundwater that supplies our wells. Activities that constitute the highest risk to our water are the following: petroleum storage tanks and fueling operations, septic systems, and animal feed lots that are no longer in use. Several years ago a gasoline spill occurred about 1,300 feet from our nearest well. As a result, our groundwater was at risk of contamination by MTBE, a gasoline additive. After two years of site treatment and monitoring water quality we are happy to report that no levels of MTBE or any other gasoline based constituent have been found in our wells.

Radon

Radon is a radioactive gas that you cannot see, taste or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, you may test the air in your home. There are simple ways to fix a radon problem that are not too costly. For additional information, call the EPA's Radon Hotline (800-SOS-RADON).

About Nitrate

Nitrate in drinking water at levels above 45 ppm is a health risk for infants of less than six months of age. High nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness. Symptoms include shortness of breath and blueness of the skin. High nitrate levels may also affect the ability of the blood to carry oxygen in some individuals, such as pregnant women and those with certain specific enzyme deficiencies. Nitrate levels may rise quickly because of agricultural activity and groundwater movement. If you are caring for an infant, or are pregnant, you should ask advice from your health care provider, or choose to use bottled water for drinking and for mixing formula and juice for your baby.

Immuno-compromised Persons

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants, can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for disease control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Security of your Water

We have recently completed a Vulnerability Assessment of our OH water facilities. This work, funded by an EPA grant, has improved the security and safety of our water supply.

Se Habla Español

Este informe contiene información muy importante sobre su agua beber. Si tiene preguntas por favor llame a Ann Katz, tel: (805) 525-4431.

Appendix C

SWRCB Grant Conditions for Operating the Forebay

GRANT CONDITIONS JIM K.

STATE WATER RESOURCES CONTROL BOARD

RESOLUTION NO. 81-17

ADOPTION OF PROPOSED GRANT TERMS FOR THE VERN FREEMAN DIVERSION/PUMPING TROUGH PIPELINE

WHEREAS:

1. The County of Ventura and United Water Conservation District were designated by the Board as grantees for the purpose of accepting an eight million dollar grant from the State Assistance Program.
2. The Board indicated that special terms would be attached to the grant.
3. Special grant terms are those terms written into a grant contract in addition to general grant terms.
4. Board staff began meeting with the grantee in October of 1980 to discuss the special grant terms.
5. Grantee has proposed a Special Assessment District (District) to raise matching funds.
6. Grantee has sent legal notices to landowners within the proposed District.
7. Landowners have until April 21, 1981 to decide whether they wish to object to the proposed District.
8. Landowners wish to know the special grant terms prior to April 21, 1981 in order to decide on their participation in the proposed District.
9. Grantee and Board staff have reached an agreement on the special grant terms.

THEREFORE, BE IT RESOLVED:

That the attached special grant terms shall be included in any grant made to construct the Freeman Diversion/Pumping Trough Pipeline with funds from the State Assistance Program.

CERTIFICATION

The undersigned, Executive Director of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on February 19, 1981.

Clint Whitney
Executive Director

II. Operating Criteria[1]

Operating criteria describe the methods and priorities by which water demands are met from available supplies. Demands consist of (1) the Oxnard-Hueneme pipeline, (2) the Pumping Trough pipeline, (3) the Pleasant Valley pipeline and (4) the spreading grounds at El Rio and Saticoy. Supplies consist of both surface and groundwater. Surface water consists of water diverted from the Santa Clara River at the Vern Freeman Diversion. (This water is diverted under "Applications to Appropriate Unappropriated Water" numbered 12092A, 12092B and 26434, of United Water Conservation District, including any permits or licenses issued as a result of these applications.) Groundwater consists of water diverted from the Upper Aquifer System (Oxnard or Mugu aquifers), or the Lower Aquifer System (Hueneme, Fox Canyon or Grimes Canyon aquifers).

Operating criteria are an integral part of the physical solution to seawater intrusion.[2,3,4] Modification of the operating criteria could result if the water level or water quality monitoring network (Section III) indicates the need for such a change. However, no changes shall be made to the operating criteria without written consent of the State Board.

Release of water to provide for fish migration below the Freeman Diversion will be made in accordance with grantees water rights permits and licenses.

1. When available storage space in the Oxnard Forebay (Montalvo Basin) is less than 80,000 acre-feet[5], the following priorities for distributing surface water shall be used to meet demands:

a. First Priority - Pumping Trough Pipeline demands shall have first priority to surface water to the extent such water is available or until the demand is satisfied. If any surplus surface water exists after Pumping Trough Pipeline demands have been met, then the surplus shall be employed for use under the Second Priority. The Lower Aquifer System will be pumped when Pumping Trough Pipeline demands are in excess of surface supply.

b. Second Priority - Pleasant Valley shall have second priority to surface water to the extent such water is available.

c. Third Priority - The Saticoy or El Rio Spreading Grounds shall have third priority to surface water to the extent such water is available.

2. When available storage space in the Oxnard Forebay (Montalvo Basin) is greater than 80,000 acre-feet[5/] the following priorities shall be used to allocate surface supplies:

a. First Priority - Saticoy and El Rio spreading grounds shall have first priority to any surface water diverted to the extent such water is available.

b. Second Priority - The Pumping Trough Pipeline demands shall be supplied from surface water which is surplus to First Priority demands. Lower Aquifer System wells shall be used to supply Pumping Trough Pipeline demands in excess of available surface water.

c. Third Priority - Pleasant Valley demands are to be met by surface water which is surplus to Second Priority demands. In no case will Upper or Lower Aquifer System wells, belonging to grantee, be used to supply Pleasant Valley demands.

3. Oxnard-Hueneme Pipeline demands are to be met according to the following conditions:

   a. Except for peaking requirements (up to 100 AF/YR) and line outage, Oxnard-Hueneme Pipeline demands are to be met by pumping groundwater from the Upper Aquifer System when available storage space in the Oxnard Forebay (Montalvo Basin) is less than 80,000 acre-feet.5/ Additional demands in excess of groundwater pumping capacity from the Upper Aquifer System are to be met by pumping groundwater from the Lower Aquifer System.

   b. Oxnard-Hueneme Pipeline demands shall be exclusively met by pumping groundwater from the Lower Aquifer System when available storage space in the Oxnard Forebay (Montalvo Basin) is greater than 80,000 acre-feet.5/

4. In cases where paragraphs II.1.b and II.2.c do not allow for delivery of 12.22 percent of "supplemental water" to Pleasant Valley as calculated over a 20-year period, deviation from the priority schedule may be required. Prior to such deviation, the grantee will notify the State Board in writing. Such deviations will be summarized in the annual report (Section IX). It is the intent of these operating criteria to maximize the conjunctive use of surface water and groundwater within Pleasant Valley. This is accomplished by first using any surface water which is surplus to recharge and Pumping Trough Pipeline demands and secondly by using Lower Aquifer System supplies when such surplus surface water is not available.

5. Total surface and groundwater deliveries to the Pumping Trough Pipeline shall not exceed 15,200 acre-feet per year. (The purpose of this term is to ensure that this grant does not contribute to an expanded water usage in the Pumping Trough Pipeline Service Area.)

6. The water quantity and quality sampling described in Section III shall be used to determine the direction of movement of the seawater intrusion front. If the seawater intrusion front begins moving inland, then the grantee shall initiate action(s)6/ to reverse the inland movement. However, any action(s) initiated by the grantee shall be sufficient to prevent action line chloride (Cl^-) levels from exceeding 100 milligrams per liter. Action line wells are shown on the attached Figure 1. If chloride levels resulting from inland movement of the seawater intrusion front exceed 100 mg/l at any action line well, the State Board shall consider instituting a Water Code Section 2100-2102 adjudication.

1/ If a groundwater management agency is formed in accordance with Section VII, operating criteria will be renegotiated with a view to assigning responsibility for implementation to that agency.

2/ Letter from Richard Smith, General Manager and Chief Engineer, United Water Conservation District, to Walt Pettit, Chief, Division of Water Rights, May 2, 1980, page 2.

3/ Work Program for 208 Area-Wide Water Quality Management Program 1980-1982 by Ventura County Board of Supervisors with participation of local agencies, dated March 19, 1980, page 8.

4/ 208 Area-Wide Waste Treatment Management Planning Study Task 4.6.10.D by Ventura County Flood Control District dated July 1980, page 8.

5/ Oxnard Forebay available storage space of 80,000 acre-feet corresponds to an average elevation of 18.8 feet at wells 2N/22W-12R1, and 22R1.

6/ Action(s) to reverse the inland movement may consist of decreasing the available storage space in the Oxnard Forebay (Montalvo Basin), and/or by requiring additional pumping reductions from the intruded aquifer.

Appendix D

Supplemental M&I Water Program

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www.calleguas.com

106 North 8th Street, Santa Paula, CA 93060
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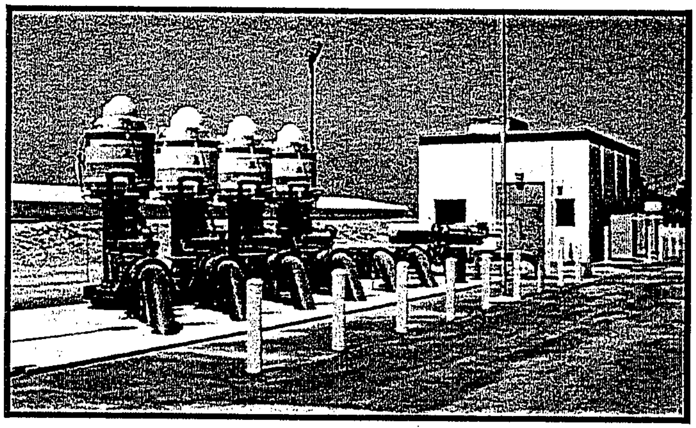
www.unitedwater.org

Supplemental M&I Water Program



The OH booster pumps, and the OH system as a whole, are capable of providing more water to OH customers.

About United Water and Calleguas MWD

United Water Conservation District manages the water resources of the Santa Clara River and its associated groundwater basins, and delivers water to cities and farms. Calleguas Municipal Water District provides supplemental imported water to eastern and southern Ventura County. Both agencies share goals of improving the long-term reliability of water supplies and making beneficial use of local water resources.

The Need for the Program

Groundwater pumping on the Oxnard plain is regulated by the Fox Canyon Groundwater Management Agency (GMA). The GMA has mandated reductions in pumping, based on a percentage of historical pumping. Some cities will experience shortages in water supplies as their pumping decreases and demands increase. Over-pumping would result in a penalty of $725 per acre-foot. There is a need for additional groundwater supplies in Ventura County. By improving local water supplies, Ventura County as a whole could become less dependent on imported water.

Background

United Water's Oxnard-Hueneme System supplies drinking water to Oxnard, Port Hueneme Water Agency, Port Hueneme, Channel Islands Beach, two naval bases, and several mutual water companies and schools on the Oxnard plain. The system consists of 12 wells, two reservoirs, two booster pump stations, disinfection facilities, and 12 miles of large-diameter pipeline. This delivery system has surplus capacity that is not presently being used. OH customers have contracted for deliveries of 14,200 acre-feet per year. The system is capable of delivering more than that, with 17,800 AF delivered in 1997. Actual deliveries are decreasing, and should continue to decrease, due to pumping restrictions imposed by the GMA. The OH system could deliver more water if it were available.

Calleguas MWD delivers water to the cities of Simi Valley, Thousand Oaks, Moorpark, Camarillo, Oxnard, and Port Hueneme; and various unincorporated areas of Ventura County. Calleguas and its member agencies have participated in a number of projects and programs that have provided for conjunctive use of local groundwater basins as well as beneficial use of local resources. The Conejo Creek Project, a cooperative project between Calleguas, Camrosa Water District, the City of Thousand Oaks, and Pleasant Valley County Water District, is now reducing agricultural pumping in the Pleasant Valley area. As a result of these programs, Calleguas is receiving GMA credits for the water conserved.

Description of the Supplemental M&I Water Program

The reserve capacity in the OH system provides an opportunity to utilize Calleguas' GMA credits for the benefit of our customers. Under the program, the OH system would deliver supplemental water to customers who requested it. In addition to the OH rate, a surcharge would be collected for the supplemental water. Participation in the program would be voluntary. The program will not increase OH rates for customers who do not participate. Up to about 4,000 AF per year of water could be delivered under the program, depending on groundwater conditions and availability, which will be reviewed annually.

The GMA credits for this program would be transferred from Calleguas to United. The surcharge would compensate Calleguas for their ongoing conjunctive use programs.

Benefits of the Program

Benefits to all Calleguas customers: Delivery of supplemental water to Oxnard and Port Hueneme Water Agency through groundwater pumping frees up capacity in Calleguas' pipelines. This will help Calleguas to meet the demands of its other customers and will help protect its entire service area from droughts and emergencies through development of a reliable local resource.

Benefits to all United OH Customers: By increasing the amount of water delivered through the OH system, this program should reduce the overall cost of delivered water for all OH Customers.

Benefits to Participating OH Customers: Some OH customers will experience a shortage of groundwater supplies due to the GMA cutbacks. Overpumping one's allocation will result in penalties of $725 per AF. The *Supplemental OH Water Program* will allow OH customers to receive additional water without using their GMA credits from their OH supply or their own wells. This program will provide cost-effective supplemental supply to meet growing demands. Those OH customers who have exceeded their suballocation amounts will have a better alternative than paying penalties. The supplemental water will be less costly than imported water.

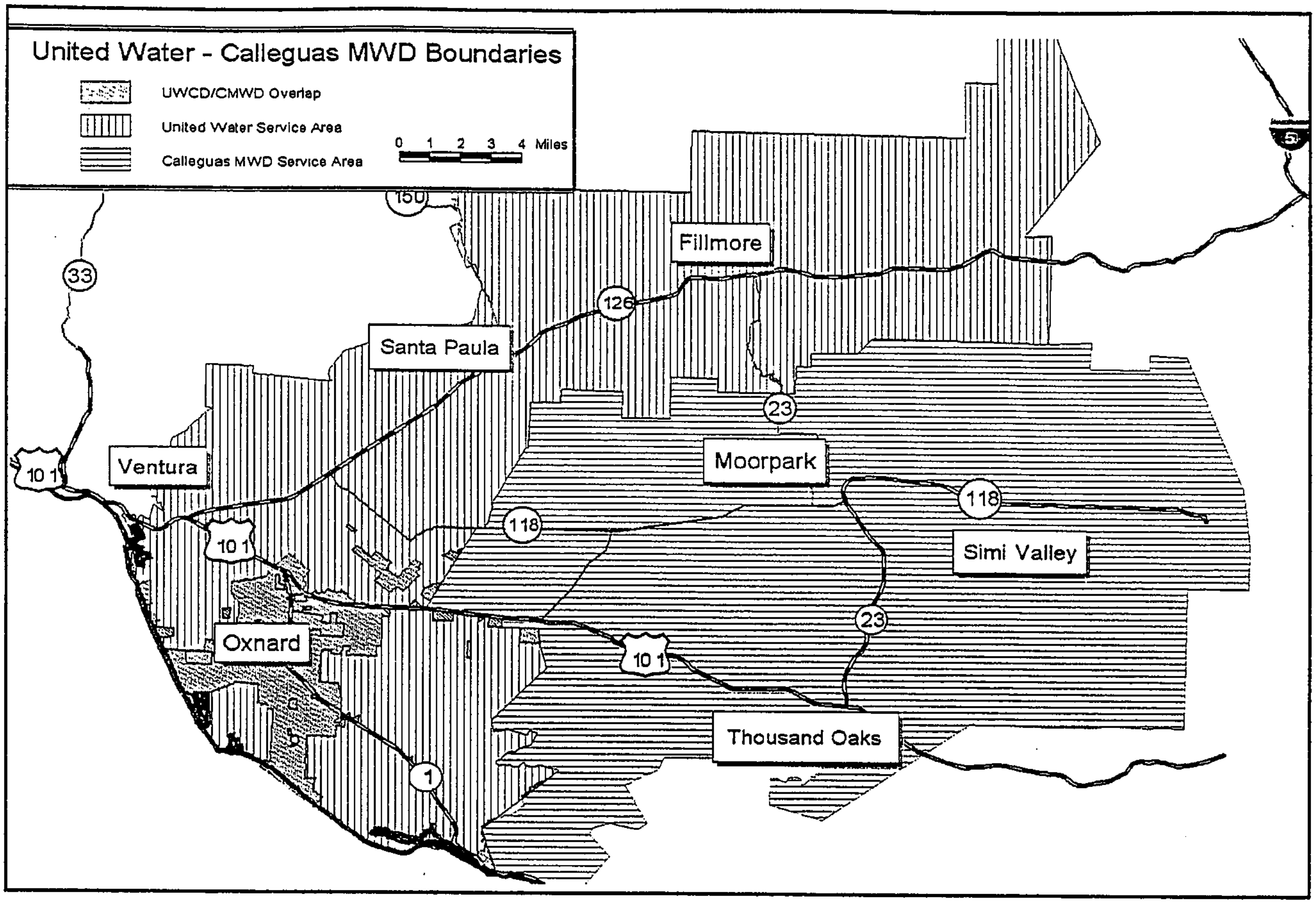
How the Program will Work

OH customers who wish to participate in the program will order supplemental water from United. The rate paid for that water will be the standard OH water rate plus a surcharge. The standard OH rate will be calculated based on the existing OH agreements, with the supplemental water treated as part of the OH water normally received. The surcharge will be a flat rate per AF. Use of supplemental water will not reduce a customer's OH credit balance. The customer will not receive any GMA credits – just the water pumped.

This program will be available to all OH customers, and not just those who have annexed to Calleguas MWD and Metropolitan Water District.

After the program starts, United's Board of Directors may be able to reduce the standard OH water rates during subsequent rate-setting periods. Calleguas' Board of Director will determine their portion of the surcharge rate. Part of the surcharge rate will be used by United to pay for any water facility upgrades required to deliver the additional water.

Availability of water for the program will be decided by United and Calleguas in April of each year, depending on groundwater levels and quality.



United Water and Calleguas MWD supply some of the same customers, including the City of Oxnard and members of Port Hueneme Water Agency. All of Ventura County will benefit from increased groundwater supplies.

Estimated Costs

The estimated cost for supplemental water is shown on the following table:

Description (2003 water rates)	**Cost per AF**
OH water rate*	$284
Program water: Standard OH marginal rate Surcharge for CMWD Surcharge for facilities Total program water rate	 $140 $200 $15 $355
Calleguas MWD Tier 2 rate	$563

* Based on GMA reductions in 2010.

The Next Steps

Calleguas and United have executed an agreement for the transfer of credits under the program. The GMA Board has approved the transfer of credits from Calleguas to United for this program. A separate agreement between United and participating OH customers will also be required before delivering any program water to those customers.

Those OH customers who may be interested in participating in this program should submit a letter of interest to Dana Wisehart, General Manager at United Water Conservation District.

Aquifer Impacts

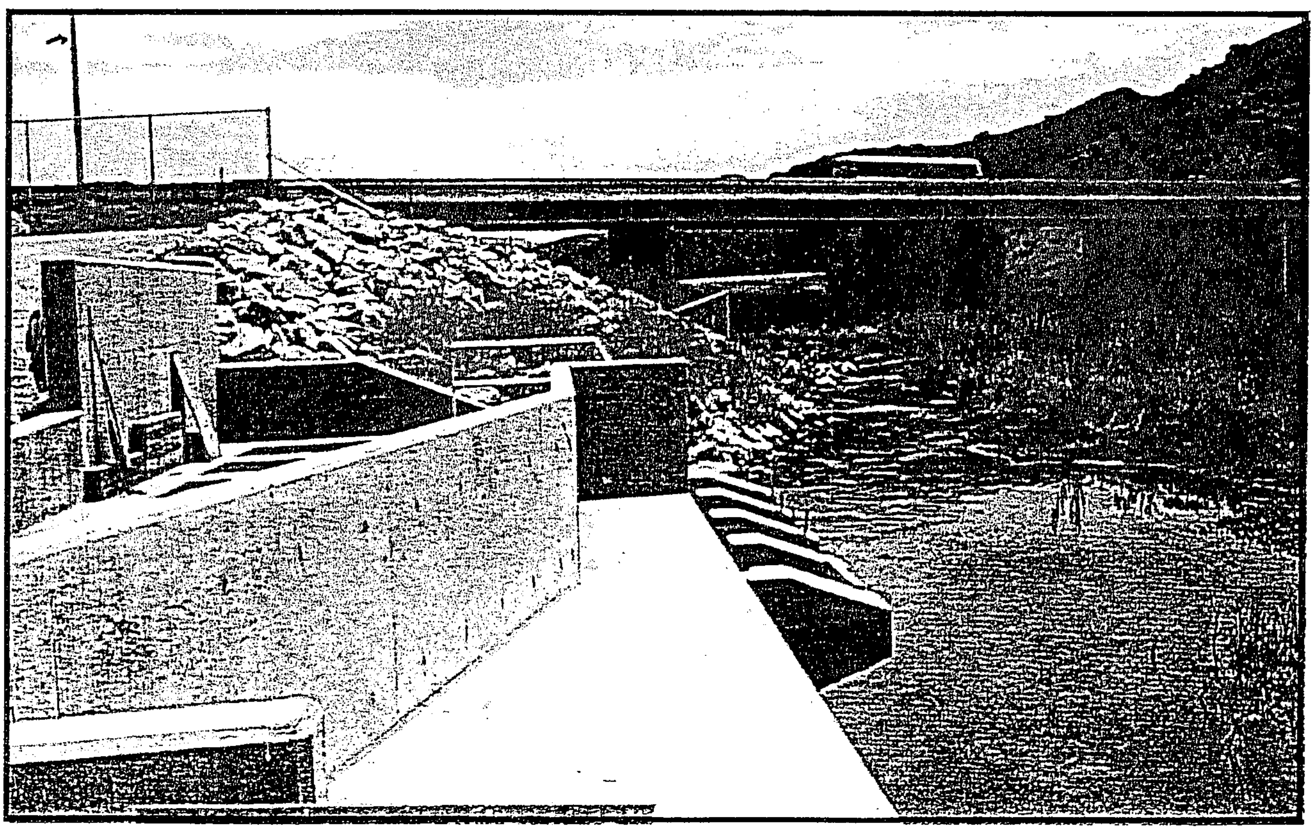
By shifting pumping from the Pleasant Valley area to the Oxnard Forebay, this program will help the aquifers in the critical eastern part of the Oxnard plain, and will increase groundwater supplies. It also shifts pumping to the upper aquifer, more easily replenished at United's spreading grounds. Based on modeling of the groundwater in the Oxnard plain aquifers, it is concluded that pumping another 4,000 AF/Yr from the OH wells will not adversely affect seawater intrusion under normal conditions.

Water Quality Impacts

Additional pumping from the OH wellfield could impact water quality for existing OH customers. Quality of groundwater in that area depends highly on the availability of surface water from the Santa Clara River. In wet to normal years, adequate water should be available for the program. In dry years, the program might need to be delayed or curtailed. Nearby MTBE contamination could also impose a limit on pumping. During the summer months, nitrate levels in the OH wells rise, and this could also place a limit on the delivery of supplemental water.

Using Water Wisely

This program allows conjunctive use of surface and groundwater sources, increasing the water available to cities and farms, and helping local aquifers.



The Conejo Creek project is delivering surface water and recycled wastewater to agriculture in the eastern Oxnard plain, using water that would otherwise flow to the ocean.